

MODERN Machine Shop

HOWARD CAMPBELL, Editor

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MODERN Machine Shop

CINCINNATI, OHIO

MAY, 1935

VOL. 7, No. 12

Accessories Expedite Work in a Virginia Locomotive Shop

Handy work-racks and safe, welded scaffolding are soon paid for in better workmanship and higher production.

BY HOWARD CAMPBELL

IN SPITE of the fact that there is at least one welding outfit in each locomotive repair shop in this country of any size, there are undoubtedly many shops where wooden scaffolding is still being used. Wooden scaffolding can be safe, but frequent repairs are necessary to keep it so and many serious injuries have resulted from defective scaffolding.

At the Portsmouth, Virginia, shops of the Seaboard Airline Rail-

way, the welders have taken over the job of building the supports for the scaffolding. As can be seen from the illustrations, they have produced supports that are not only more compact

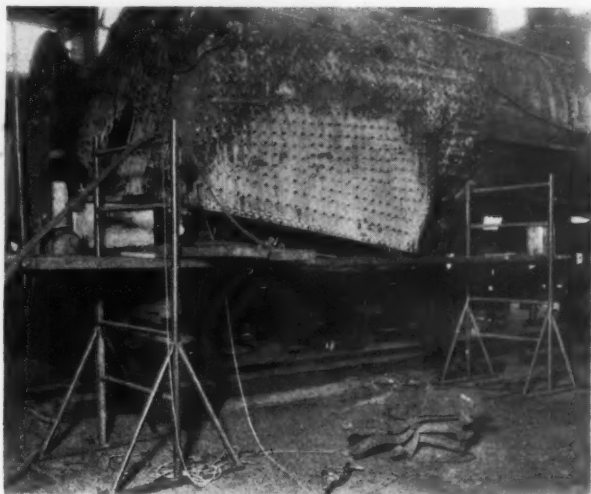


Fig. 1—Scaffold supports built of scrap pipe and flues, welded together. Such supports are compact, neat, and safe.

and much better looking than the wooden supports which they replaced, but the welded supports are practically

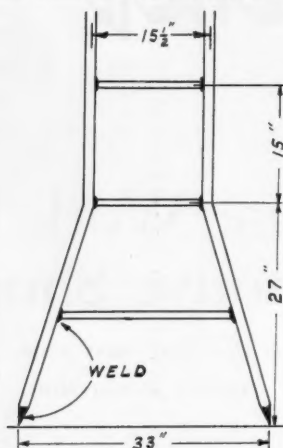


Fig. 2—Drawing showing design of welded ladder.

indestructible. When a workman climbs onto a scaffold made with supports like these, he knows that his safety doesn't depend on a few spikes.

The illustration Fig. 1 is a good view of a scaffold built with welded supports. The supports are made of scrap pipe or old superheater flues and engine and boiler flues. The vertical sections are of tubing or pipe that is 2 inches outside diameter, and the horizontal pieces are of pipe that measures $1\frac{9}{16}$ inch outside diameter.

The base pieces or "feet" are made of $\frac{3}{4}$ x 4-inch iron, cut to lengths of 36 inches. Braces are of the same pipe that the crosspieces are made from,

cut at the proper angle to fit at the lower ends and flattened at the upper ends. No bolts or screws are used; the job is welded throughout. The supports shown are approximately 7 feet high, but some are 9 feet, and they can be made to any height required.

Ladders for climbing to the tops of the engines are also made by the method described above. The ladders are usually 10 to 12 feet long, the side pieces being of 1-inch pipe and the rungs, or cross-pieces, being of $\frac{1}{2}$ -inch pipe. The ladder is $15\frac{1}{2}$ inches wide, as shown in the drawing Fig. 2, and the rungs are approximately 15 inches apart. At the second rung from the bottom, the legs spread at an angle, as shown, to provide added safety.

Points at the bottoms of the legs make it possible to locate the ladder so as to minimize the danger of slipping. To further eliminate danger of slipping, lugs made of $\frac{1}{4}$ x $\frac{3}{4}$ -inch iron, bent at right angles, are welded to the side-pieces of the ladder in such

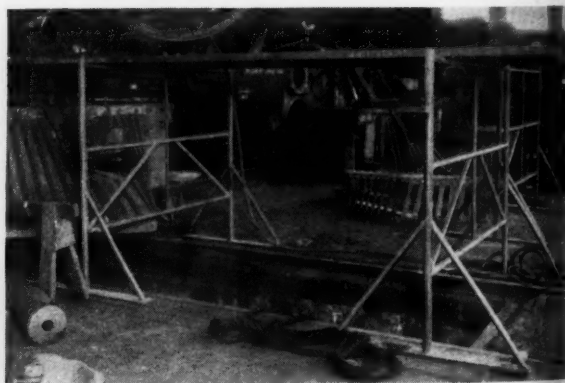


Fig. 3—Welded scaffold supports for superheater flues.

position that they will hook over the edge of the running board of the locomotive and thus prevent the ladder from sliding. Several sets of these lugs are welded on to the under side at

Fig. 4—

points
Weld
heater
Fig. 3
descri
same

Fig.



Fig. 4—A rack of this type expedites the work of building locomotive cabs.

points about 6 inches apart.

Welded scaffold supports for superheater flues, such as those shown in Fig. 3, are also built by the method described above. The parts are of the same diameters as those given above,

but the cross pieces are long enough so that the scaffold will straddle the pit, and the top crosspiece is 66 inches from the floor.

To facilitate the rebuilding of locomotive cabs, the racks shown in use in Fig. 4 are used. The legs of the rack are of 2¼-inch superheater tubing, braced with sections of 1-inch tubing, welded in. The legs support a length of T-iron that has been curved to shape to fit the roof of the cab, as shown, and the cab is built upside down. The stability afforded by a solidly-built rack of this nature is an item of no small importance.

The feeding of sheet steel to the Ryerson combination punch press shown in Fig. 5 was an awkward job until the rack shown in the illustration was designed. This rack holds the sheets at the proper level for processing and keeps them flat. Prop-

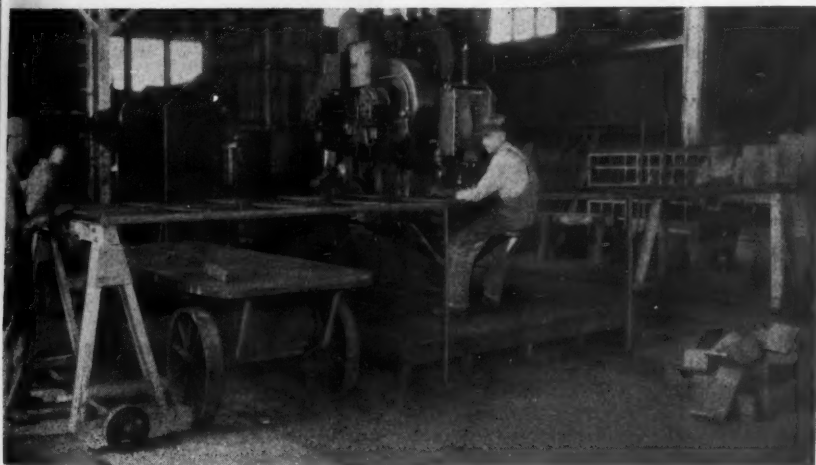


Fig. 5—These racks hold the sheet steel at the correct height for feeding to the punch press.

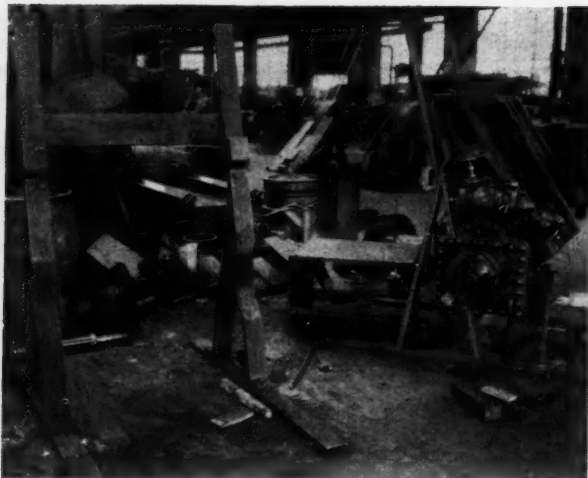


Fig. 6—A simple rack like this one will hold an Elgin stoker in the most convenient position for overhauling.

erly speaking, there are two racks—one at each side of the machine.

Each rack has four horizontal side rails, each pair of rails supporting a set of rollers. The side rails are of 2-inch angle iron, and the rollers are sections of 1-inch pipe through each of which extends a piece of $\frac{3}{4}$ -inch rod to serve as an axle. The ends of the axles project through holes in the side rails, the holes being drilled so that the rollers will project above the level of the rails and support the work so that it will rest only on the rollers.

The rails are supported at the ends nearest the machine by vertical sections of angle iron which serve as legs, and at the opposite ends by wooden trucks resting on wheels. Thus by lifting the stationary end of the rack, the rack may easily be moved about. The trucks are built of 2 x 4-inch and 3 x 4-inch wood sections; the axles are of 1 $\frac{1}{4}$ -inch square iron turned at the ends, and the wheels are 8 inches diameter with 2-inch rims. These racks are not only of great convenience, but they undoubtedly save

enough in time and labor to pay for themselves many times over each year.

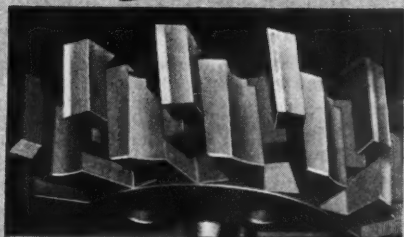
A rack for holding Elgin stokers while they are being overhauled is shown in Fig. 6. Although of simple construction, the rack would be almost indispensable in any shop where there was any amount of stoker work to be done. It is constructed almost entirely of $\frac{3}{4}$ x 4-inch iron, one vertical section on each side of the rack being formed so that the

retaining lug on the stoker can slip down into the bend and thus hold the stoker in position without need for bolts or clamps. In addition, the stoker is held in the most convenient and accessible position for the workman.

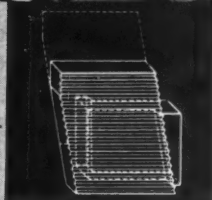


Fig. 7—Using a cradle to assemble an air reservoir to a locomotive.

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Although it does not properly come under the heading of "racks", the device shown in Fig. 7 is worthy of mention. The device is a cradle for holding the air reservoir in position while it is being assembled to the engine, and is used in connection with the electric crane. The cradle is made from 3 x 3-inch T-iron, formed to the shape shown and reinforced by two cross pieces of the same material, welded in. It is so made that it will pick up any reservoir and swing it into place under the running board, or it can be used to remove the reservoir in the same manner.

A small amount of material and a little of the welder's time, invested in fixtures, work supports, and scaffolds, will produce large dividends.

BOOKS

MACHINERY'S HANDBOOK (Ninth Edition). Erik Oberg and Franklin D. Jones, Editors. 1592 pages, 4 1/4 x 7 inches. Published by The Industrial Press, 148 Lafayette St., New York City. Price, \$6.

"Machinery's Handbook" contains the mathematical tables, rules, formulas, general data, and established standards used in shops and plants where all classes of machines or other mechanical devices are designed and manufactured.

The Ninth Edition has just been published in order to include new or revised standards of particular importance in machine design and construction, and miscellaneous mechanical data representing recent developments in engineering and manufacturing practice.

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Owners of the Eighth Edition will be particularly interested in changes in the Ninth. The major revisions of the Ninth Edition include new strength of materials data; load capacities of ball and roller bearings; recent developments in plain bearing design; new tables and information on designing different classes of gearing, including spiral bevel and hypoid gears; enlargement of small pinions to

avoid under-cut teeth; revised S & A standards; socket-type set-screws and cap-screws; additional screw-thread data; standard milling cutters; new section on roller chain transmission covering American standard chain sprockets and cutters; revised speed and feed data including data from actual practice on cemented-carbide tools; new standards for taps, gages, and milling cutters; hardness conversion table; electric motor characteristics of value to machine designers; die-casting compositions; weight tables for brass, aluminum and copper; and, in addition, a great many smaller sections and revisions pertaining either to new or improved standards or to recent developments.

The handbook is divided into 126 main subjects, and any one of the many thousands of items in these main divisions can be located readily by referring to an exceptionally complete index containing whatever main or entry word the user is likely to think of. There is also a special "thumb index" for opening the book instantly to any one of the fourteen main sections most frequently consulted.

DIE CASTINGS. By Herbert L. Chase, M. E. 264 pages, 5 3/4 x 9 inches. Cloth board binding. Illustrated with photographs and drawings. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price, \$3.50.

This book deals with the design, composition, application, specifications, testing, and finishing of die castings. It has been the author's aim in writing this book to supply engineers, product designers, executives, students, and others engaged in the metal-working arts with the latest and best information available on die castings.

However, although the book outlines briefly the methods used in the production of die castings, its main concern is with the product itself—its composition, uses, and design. The text is concise, specific, and easy to read. The author presents material that demonstrates the technical possibilities of die castings, sets forth the characteristics of the various alloys suitable for die casting, and instructs the reader in the intelligent design of die castings.

Facts are presented that should be useful in the specification, inspection and testing of the die castings, together with an outline of the types of finishes available for such castings. Included are useful particulars on the preparation of the castings for finishing, and on the methods used in the finishing processes.

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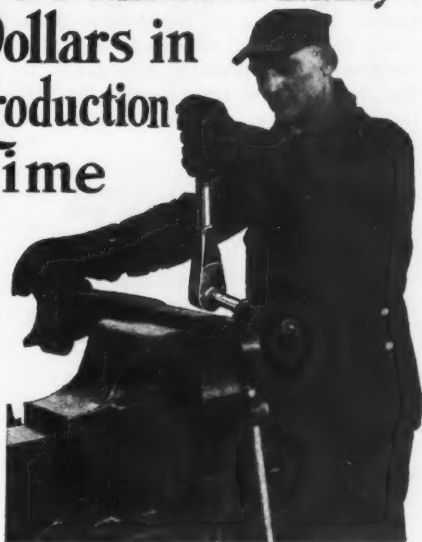
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Punch Press Operations and Tools, VIII

Inverted compound dies offer advantages which are important in certain cases. These advantages, together with the outstanding features of inverted compound die design, are presented in this article.

By C. L. SZALANCZY

Die Designer, Westinghouse Electric & Mfg. Co.

IN CONSIDERING the production of metal stampings, especially when the order is for large quantities, the saving of material and the reclamation of waste or scrap should be given very careful consideration. This statement is especially applicable to the production of transformer lamination stampings, a large portion of

pieces as that shown in Fig. 1 are blanked out. Such pieces are often large enough so that one or more smaller pieces can be made from each of them, thus utilizing material which otherwise would have to be baled and sold for whatever it would bring as scrap metal.

To a certain extent, the type of tool used has a bearing on the saving that can be made, and a compound die of the inverted type is one of the most economical from this standpoint. The inverted compound die is a die of the compound type in which the moving part, or ram, carries a male die for cutting the blank from the stock. This type of tool is considered the best for the production of such parts as silicon iron laminated stampings, which are made from 0.014 to 0.017-inch material.

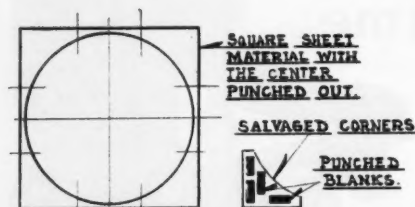


Fig. 1—Corners of square material from which the center has been punched may be salvaged.

which are made from silicon steel, which is comparatively expensive.

To provide for the maximum saving on scrap, the work should be planned so as to obtain the greatest possible number of pounds of punchings per strip of material, then use the scrap for the production of smaller parts. There is usually a quantity of centers left from the blanking of larger parts, also triangular pieces that have been sheared from corners when such

The punchings may be made from strip material with the die set so that the strips will be fed from the rear to the front. In following the usual procedure, the press operator pulls the strip through as indicated, then he reverses the strip and, holding the blanked end, pushes the strip material toward the rear of the press. After the material has properly been located, the operator feeds it through the machine until the strip is finished.

Since in the inverted compound die

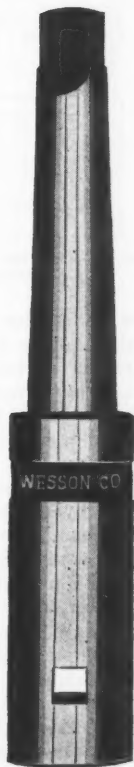
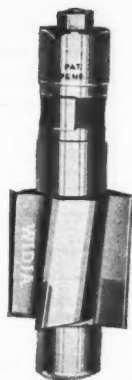
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the blanking die is on the bottom, resting on the press bed, and the punch is at the top, attached to the ram, the finished blank is pushed out of the die in such manner that it lies on the

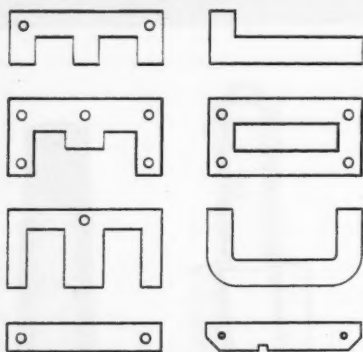


Fig. 2—Drawing showing various types of transformer punchings.

die under the scrap where it may be pulled forward by the operator as the strip is pulled along. Thus the finished punchings are stacked in front of him and, from time to time, he places them in pans provided for the purpose.

A considerable saving can be made often by using up the scrap material that has been left from other jobs, using compound or inverted compound dies. These dies are the only tools, however, in which stampings may be produced from scrap material, but it is possible with these tools since they both complete the piercing and blanking operations at a single stroke of the press. Also, there is no enclosed type of stripper through which the material has to pass, as would be the case if a die of the progressive type were used.

When using scrap material to make stampings, there is no systematic procedure for cutting. The operator simply handles the material so as to obtain as many stampings as possible from each piece of scrap. While the

production time will be much slower, the material savings will more than offset the loss of time.

Transformer laminations, several of which are illustrated in Fig. 2, are usually of the right angle type. A simple design of transformer punching is shown in Fig. 3, however, this particular blank being made of 0.017-inch silicon steel with two 0.129-inch holes punched in it to provide clearance for the $\frac{1}{8}$ -inch diameter rivets with which the completed assembly is held together.

The drawing Fig. 4 illustrates the design of the inverted compound die used to produce the blank shown in Fig. 3. The die set, indicated at A, is large enough to hold the die and at the same time allow the guide pins B to be set far enough apart so that the strip material can be passed between them.

The die plate C may be made from round hot rolled steel of sufficient diameter so that machining on the outside may be eliminated. This plate is surface ground on both sides to make it flat and parallel, and is counter-

BLANK MADE FROM .017 SILICON STEEL .129 DIA. HOLES.

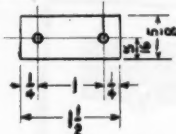


Fig. 3—Drawing showing design of blank made by the inverted compound die shown in Fig. 4.

bored $\frac{1}{8}$ inch deep to allow the die piece D to be set into it, as shown. The plate C is also used as the holder for the small punches E. These punches may be made up and carried in stock as explained in the second article of this series, which was published in the November, 1934, issue of MODERN MACHINE SHOP.

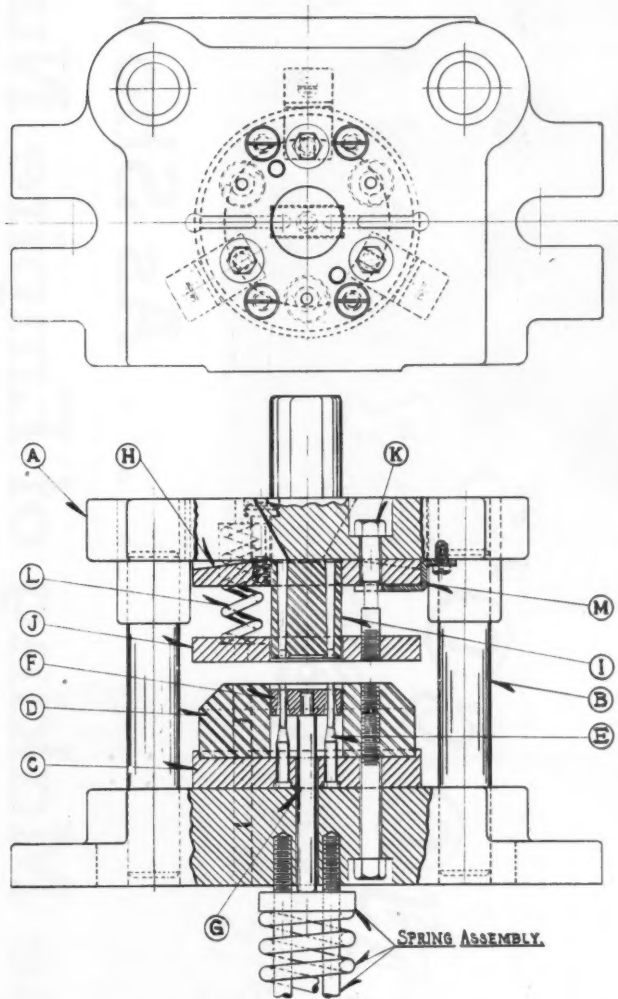
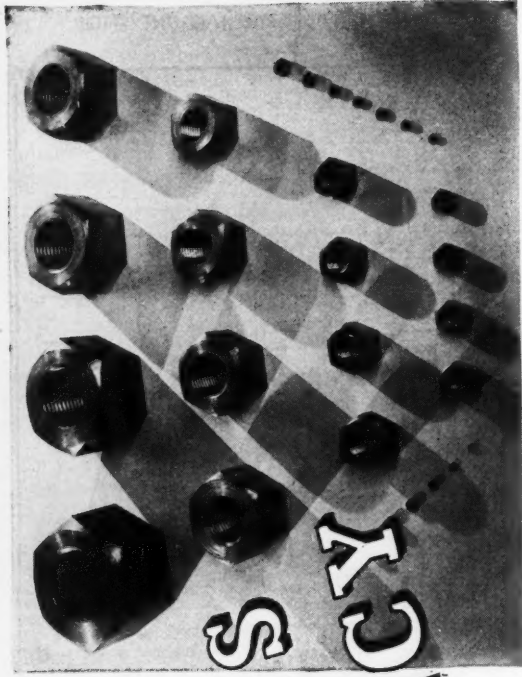


Fig. 4—Typical construction of inverted compound die for producing the blanks shown in Fig. 3.

The die piece D is made of tungsten high speed steel and is finish-machined to the blank size with no taper inside. It is then hardened to maximum hard-

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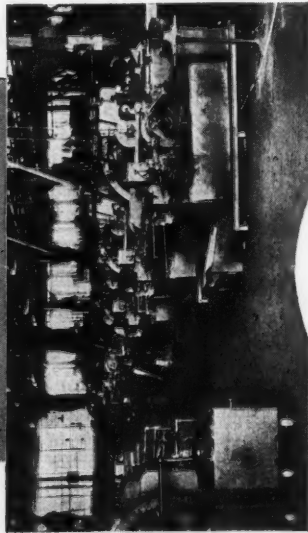
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ness, which is 85 to 90 scleroscope. Care must be taken, when designing the tool, to allow plenty of material for the die so that it will not crack through the corners, as shown in Fig.

BREAKAGE USUALLY OCCURS AT POINTS MARKED X.

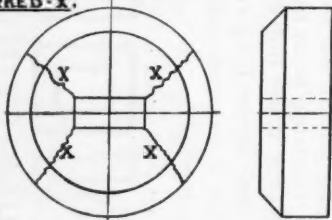


Fig. 5—Enlarged view of blanking punch used in inverted type of compound die.

5. When a die has sharp or square corners, as in the case illustrated, breakage will sometimes occur due to the fact that the die is too weak to stand the strain that occurs at the corners. For this reason it is frequently best to build the die up of several pieces instead of making it from a solid piece.

However, when a built-up die is used, an extra die-plate or ring must be employed to lock the sections together. This ring is either bored to a shrink fit and then shrunk on, or the opening is machined or burned out to provide a clearance of approximately $\frac{1}{16}$ inch all around and then the space thus provided is filled with molten Matrix Metal. If the latter method is used, the die parts are first anchored to the die plate with screws and dowels.

As the blanking and piercing operation on the part shown in Fig. 3 is completed, the finished blank is carried up and out of the die by the ejector F. The ejector, which is made of chrome vanadium steel, supports the upper ends of the small punches E and the holes through which the

punches operate are counterbored at the lower ends so that the ejector can slip down over the tapers on the punch-shanks.

Where this method is used, the punches may be ground $\frac{1}{4}$ or $\frac{1}{8}$ inch farther down, thus prolonging their life. The ejector is machined very nearly to size, then hardened to 60 to 80 points scleroscope and finally ground to a slip fit in the die. It carries the stub steel stripper pin G, which is actuated upward by the spring assembly shown attached to the bottom of the die by the use of the two $\frac{3}{8}$ -inch studs.

The die and lower plate are aligned and anchored to the bottom shoe with three hexagon-head machine bolts and three dowels, as shown. The dowels should be hardened and of sufficient length to pass through the plate and enter both the die shoe and the die to

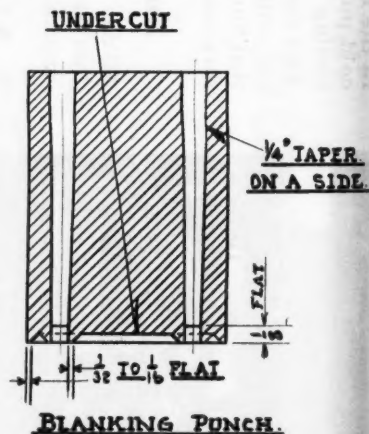


Fig. 6—Drawing of Blanking Punch.

a depth of $\frac{3}{4}$ inch. The punch H is of round hot rolled steel, surface ground on the top surface to assure perfect setting and anchored to the top shoe with three filister head screws and three dowels. As signi-

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fied by its name, the plate is used to hold the punch I in position.

The punch I is of tungsten high speed steel, and is somewhat different in design from any of the punches previously discussed in this series of articles. This punch is machined very nearly to size, and is then relieved on the bottom end by drilling and chipping so as to form a flat approximately $\frac{1}{16}$ inch wide all around back of the

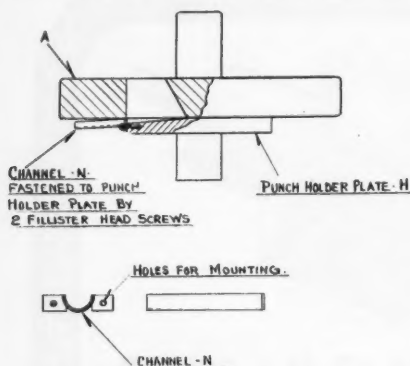


Fig. 7—Drawing showing location of channel N.

cutting edges, as shown in Fig. 6. The two holes for the small punches E are made straight for a distance of approximately $\frac{1}{8}$ inch and are then tapered $\frac{1}{4}$ degree on a side. The punch is then hardened to 45 to 50 scleroscope and finish ground all over to finish dimensions—which are the sizes on the part drawing plus the necessary clearance.

The reason for working out the bottom of the punch in the manner shown is that it can be hammered up when the punch has been reground several times, thus closing the holes in. Otherwise when the punch has been ground down to the tapered part, the round holes will increase in diameter with each grinding, making it impossible to maintain the standard clearance. The result would be that

a burr would be formed around the circular openings in the blank. By hardening the punch as specified, it is possible to hammer it in and then at the first engagement of the punch with the die, afterward, the punch will shear its way into the die and form the required clearance.

The top stripper J, Fig. 4, is of round hot rolled steel, surface ground on the bottom surface, and machined out to a slip fit on the punch I. It is counterbored $\frac{1}{8}$ inch deep in three places to provide seats for the springs L. The stripper is attached to the top shoe with three special-type stripper screws K which are made adjustable so that the stripper may be set to the correct position below the cutting surface of the punch. After it has been set, the stripper screws are locked, to keep them from turning, by the use of the special wrench locks M (described in the seventh article of the series, page 41, April, 1935, issue).

Of particular interest is the method used for the disposal of the scrap slugs from the two pierced holes. Since the piercing punches are located in the lower part of the die, the piercing action is upward, consequently the slugs are passed up through the blanking punch I into a scrap channel machined into the upper shoe. These channels are elongated slots somewhat larger than the diameter of the slugs and are so made that they pass the outer edge of the punch plate H, which also has two slots machined into it to correspond with the slots in the upper shoe.

The slots in the punch plate, however, are tapered downward to facilitate the outward movement of the slugs. The channel N is of sheet iron, as shown in Fig. 7, and one is placed under each opening to catch the slugs as they fall out and thus prevent them from falling directly onto the material that is being blanked. This



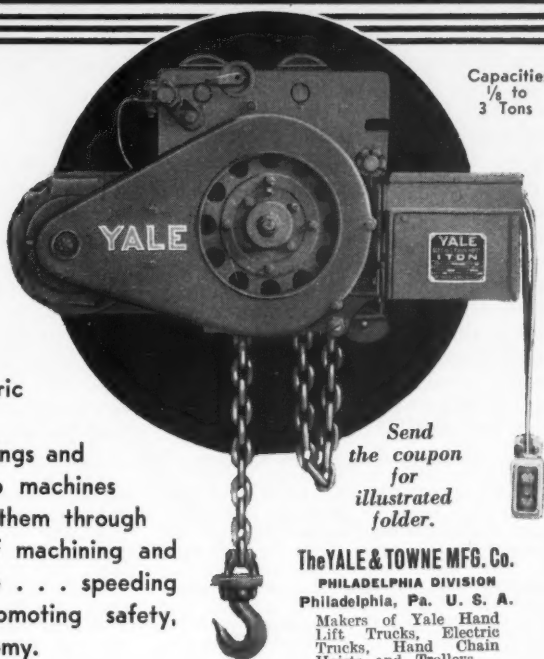
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feature eliminates a lot of miscuts and also reduces the hazard of breakage on the punch.

Although, as stated previously in this article, the inverted compound die is not usually made for blanking materials that are heavier than 0.017 inch thick, it is sometimes necessary to produce heavier blanks that are identical in contour and in general dimensions with the lighter laminations. The heavier blanks are usually made from 0.0625-inch material, and are used as end plates when assembling the laminations together.

Since only two end plates are required to an assembly, it would not be economical to build an entire extra die to produce them. In such cases, however, a complete upper part of the die may be made which will be constructed exactly like the upper assembly shown in Fig. 4 with the exception that the punch I will be made smaller to allow the proper clearance for the 0.0625-inch material and the same amount of clearance will be

added on the two holes in the same item.

Some little difficulty has been experienced, in the past, in aligning the guide pin bushings in the additional upper part of the die, since the guide pins are located in the lower die shoe of the original die. However, now that the use of Matrix Metal has become common practice, all difficulty has been eliminated.

The holes for the bushings are laid out on the punch shoe and bored out to about $\frac{5}{8}$ inch larger than the outside diameters of the bushings. After the punch assembly has been located and fastened, the bushings are placed in position on the guide pins and the upper part of the die is located and blocked up in closed die position with the bushings in their correct places. Hot Matrix Metal is poured around each bushing, and after it has cooled, the upper member of the die may be removed. When again assembling the two parts of the die, it will be found that the alignment is perfect.

MONARCH INDUSTRIAL FILM AVAILABLE: The Monarch Machine Tool Company, Sidney, Ohio, has produced an industrial film entitled "The Development Of The Lathe." In quick, dramatic fashion, this film pictures the development of the lathe from the original tree or pole lathe of 500 A. D. down through its various stages of development to the first geared head lathe of 1900. Following this the film shows a number of Monarch lathes in operation, including the Monarch Keller Form-Turning Machine equipped with Centrode Device and Oval Chuck, the new Magna-Matic All-Electric, Full Automatic Double Carriage Lathe, specially tooled Monarch Engine Lathes and the Monarch Precision Hand-Feed Surface Grinder.

A limited number of these films are available in 16 and 35 MM size for loan to industrial organizations, technical societies, and so on.

BATH CATALOG No. 12-B: Due to the valuable information, aside from descriptions of the sponsor's products, that is contained in this nicely printed

68-page book, it will undoubtedly be of value to every plant executive who has anything to do with the selection or purchase of taps. A chapter on "Common Tap Troubles and How To Correct Them" is divided into sections as follows: (1) Faulty or Inadequate Lubrication; (2) Wrong Drill Used; (3) Furnishing Tap Binding; (4) Dull Taps; (5) Taps Cutting Oversize. Another chapter "Things To Look For In Checking A Tap" contains these divisions: (1) Accuracy; (2) Hardness; (3) Fluting; (4) Pointing; (5) Concentricity; and (6) Quality of Thread Grinding. This chapter discusses the pitch diameter, lead and angle, manner of grinding hook or rakes on flutes, and so on.

The back of the book contains a number of useful table and reference data regarding taps, screws and gages. The major portion of the book consists of descriptions and specifications of the wide line of taps, thread gages, thread rolling dies, and super internal micrometers made by this firm. A copy of the book can be had by addressing John Bath & Company, Inc., Worcester, Massachusetts.

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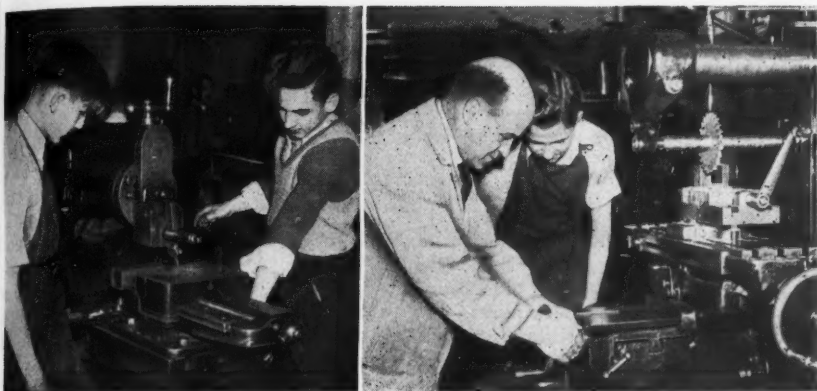
The courses in these schools are free to qualified residents of Buffalo who are under 21 years of age. Students who live outside the city must

The boy shown at the top of the page is learning to make working drawings for sheet metal construction. In the center picture the student is learning how to drill a hole without breaking the drill. At the left is a view of the lathe section at the McKinley Vocational High School, showing a lathe class in session. With such equipment and individual instruction, every opportunity is presented for the development of unusual ability.

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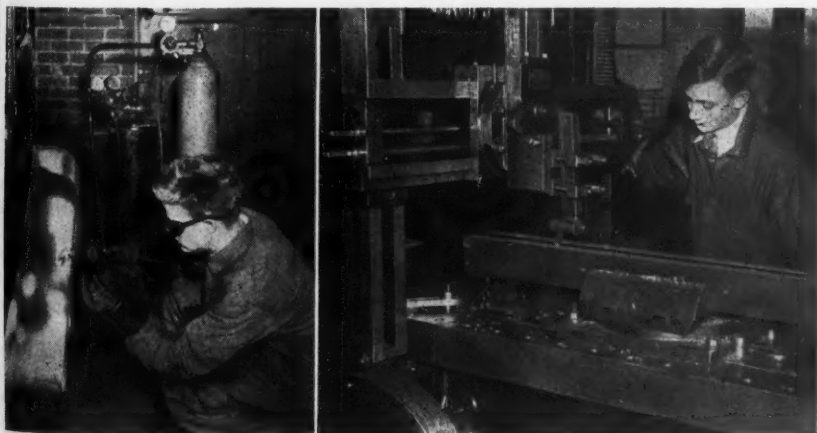
The boys shown at the left, students at the Peckham Vocational High School, are learning how to operate the shaper. At the right, George Reid, one of the instructors at the Peckham School is instructing a student in the operation of a Brown & Sharpe universal milling machine.

pay a special tuition fee.

In addition to general machine shop training, the students are trained in automobile construction and repair, aviation engine repair and airplane construction. Instruction in these latter two courses is designed specifically to enable the student to enter the automotive or aeronautic fields as a

skilled artisan. The work is not confined to mechanical processes with tools; instruction in the theory of aeronautics and the theory and principle of the internal combustion engine is a part of the training course. The few pictures shown here convey but a meager idea of the facilities of these fine vocational schools.

Below, at the left, an auto repair student at the Burgard Vocational High School is shown welding a hole in an automobile fender. The student at the right, in class at the Seneca Vocational High School, is learning the fine points of planer operation.



Design and Manufacture of Spline Gages

By F. J. WILHELM

MOST mechanics are familiar with spline gages, but when one must be held to a very close tolerance it is necessary to employ a few tricks in order to maintain extreme accuracy. In the accompanying sketches are shown two very good gages of male and female design, the design of the latter being such that

B, Fig. 1, which has been ground square all over. For illustration purposes we have been forced to use a few dimensions which, of course, must be in accordance with the job to be made.

The plate B is bored to receive the shank F, which has been ground to a size corresponding to the diameter of the part to be gaged, and the fin G, which is a part of shank F, should be ground the exact width of the slots as the pin is the point of gaging the slots as to concentricity. This is done by setting the plate on the edge A against an angle iron on a surface plate and indicating the side of the slot and fin.

When grinding the slots, the top pin should set a little lower than the bottom of the slot so that the grinding wheel will not strike it. After the first slot is ground, the spline is

moved over to latch C and the piece D is inserted in the latch and spline. The latch, which has been ground at 30 degrees to surface B and is screwed and doweled in place, must hold the spline at a positive 30-degree angle. Then the spline is again clamped down to the plate by two small strap clamps out of the line of the wheel and the second slot is ground. This process

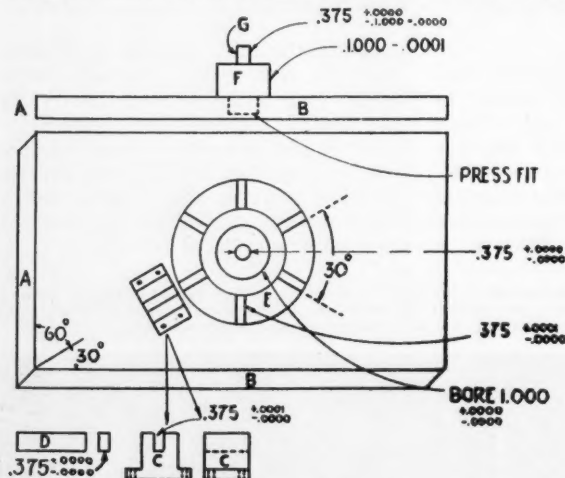


Fig. 1—Gage for determining the accuracy of spacing of splines on a shaft.

it might be termed "universal", as it can be adjusted to take any depth spline or can be equipped with fingers of any width.

For example, a six-point spline will have six equally spaced slots of 30 degrees (should it be an eight, the degree is changed, of course); in this case the latch block C is set at 30 degrees from the side of the plate

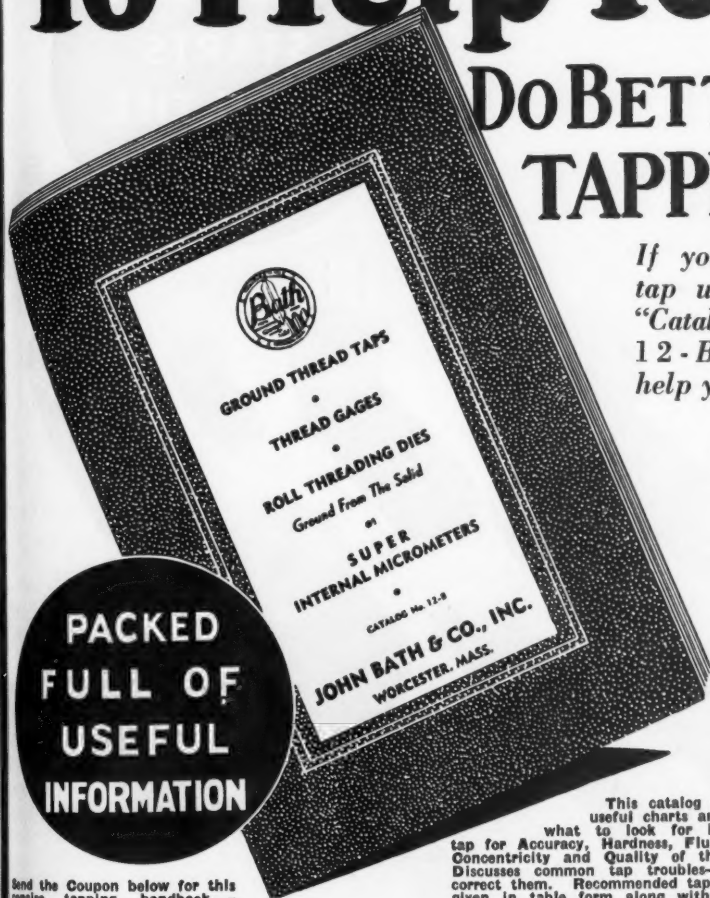
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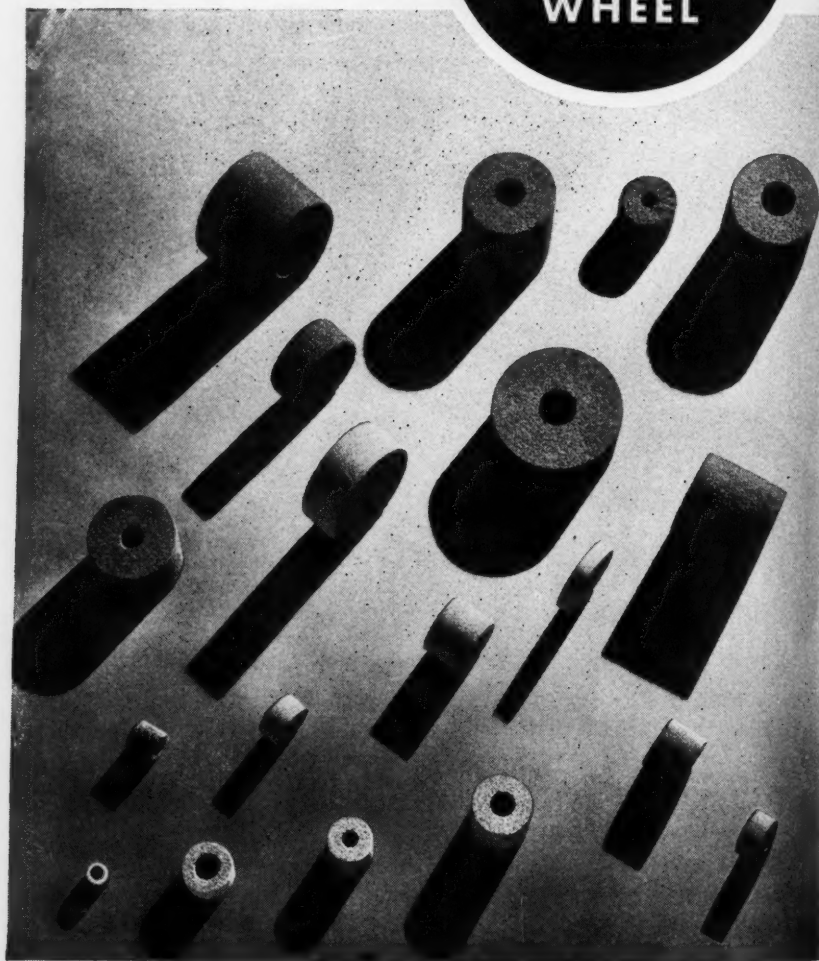
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is repeated on the next setting, which is the third and last.

Two slots are ground at one setting.

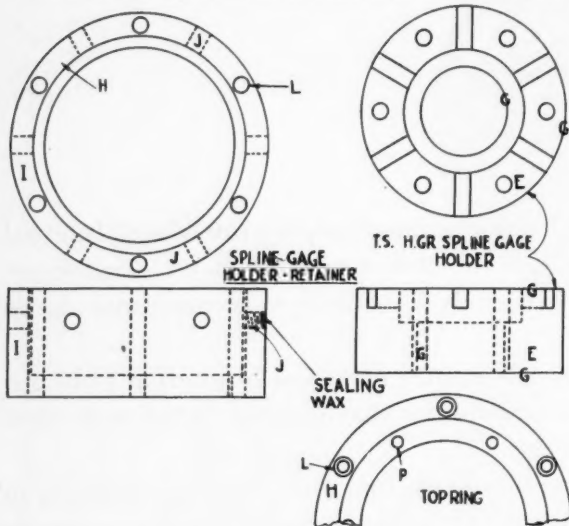


Fig. 2—Drawing showing design of spline gage holder and its retainer.

Care should be taken that the magnetic chuck and rail are ground true, as the repeated settings will require this. It will take quite a number of indicatings to grind a slot concentric to a high degree of accuracy. In this case it is fitted to a 0.375 gage block, but as stated before, the dimensions are only to better illustrate the tolerance. The pin or shank F should be indicated at right angles and the plate should be of sufficient size to give it a good bearing to rail at A and length at B. It should be as wide as a magnetic chuck to give it a good surface bearing. All the above is shown in Fig. 1.

In Fig. 2 is shown the gage holder E, which we just described. This piece is a light press fit in the retainer I, which can be of soft steel and is drilled on the sides to receive the head-

less set screws indicated at J. At six equal points these screws adjust the

fingers and are sealed with sealing wax. Next, the top ring H is drilled so that it can be fastened to the retainer by screws in the holes L. The ring is drilled with six holes P to receive headless set screws to hold the fingers down. Then they are sealed. This is better shown in the sectional view Fig. 3, the different size fingers being shown at A.

At Fig. 4 is a top view of the finished male spline gage showing how the outside of a spline shaft is gaged by the hole in the gage, the fingers taking care of the splines. The secret lies in the latch method, which saves

the repeated settings of a sine bar on the slots and eliminates the possibility of getting over the tolerance

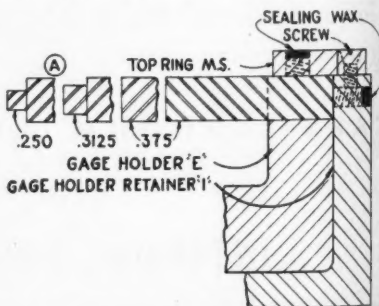


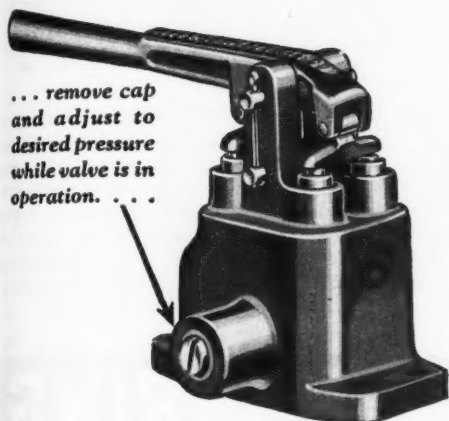
Fig. 3—Detail drawing showing construction of spline gage holder.

limit. In this case the angle must be right and the spacings also.

In the grinding of a female spline gage, the same method can be em-

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ployed; that is, the latch can be used even if a dividing head is used. The latch would be more accurate

table, using blocks to make it level and rotating the shaft by hand. After one spline is ground central, the latch is

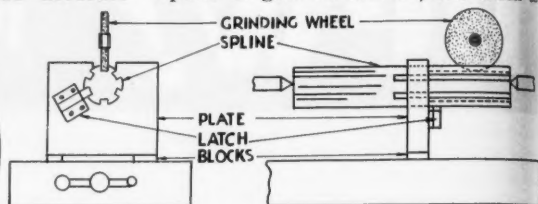
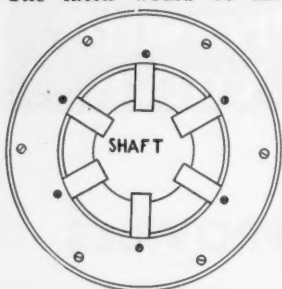


Fig. 4—(Left)—Showing how gage is used to determine accuracy of width of spline and diameter of shaft.
Fig. 5—(Above)—Diagram showing method of setting up machine to grind splines correctly.

where an inaccuracy is apt to occur due to backlash in the dividing head—regardless of how careful one may be. This is illustrated at Fig. 5. The plate, in this case, is bored to receive the finished O. D. of the spline gage. Then the latch is mounted at the desired degree. The plate must be squared and bolted to the grinder

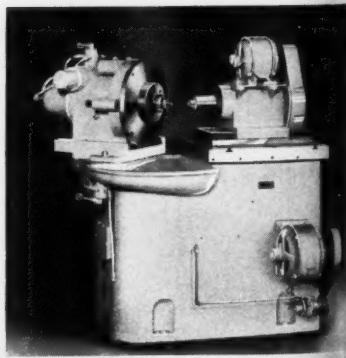
entered into it and the gage has each spline ground central until the splines are all finished. It can readily be seen that this method is very accurate. While it takes a short time to make the fixture, the cost is far greater should one produce an inaccurate gage. The proper amount of preparation is more than half the job.

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Above: Checking composition of steel for files in Disston Chemical Laboratory



Photographing structure of file steel at magnification of 1,000 diameters, in Disston Physical Laboratory.



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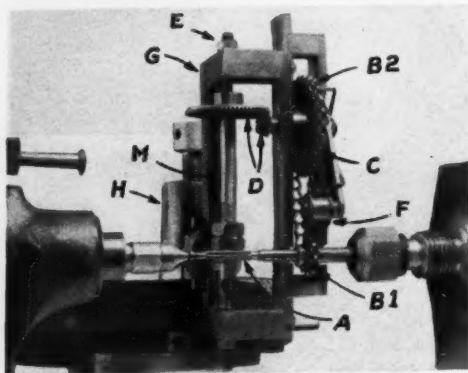
☛ IDEAS FROM READERS ☛

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

Hobbing Small Worm Wheels in the Engine Lathe

BY CHAS. M. PIDGEON

HAVING need for a number of small 48-tooth bronze worm wheels, and lacking a hobbing machine of the size and type with which such



Lathe attachment for cutting small worm-wheels.

wheels are usually cut, we designed the lathe attachment shown in the accompanying photograph. With the aid of this mechanism, which is of comparatively simple design, an engine lathe is converted into a hobbing machine.

The equipment consists of a frame to which a shank is attached so that it can be held in the toolpost of the lathe. The frame is indicated at G. The work-piece is carried on a vertical shaft M that is driven from the lathe spindle, power being transmitted from

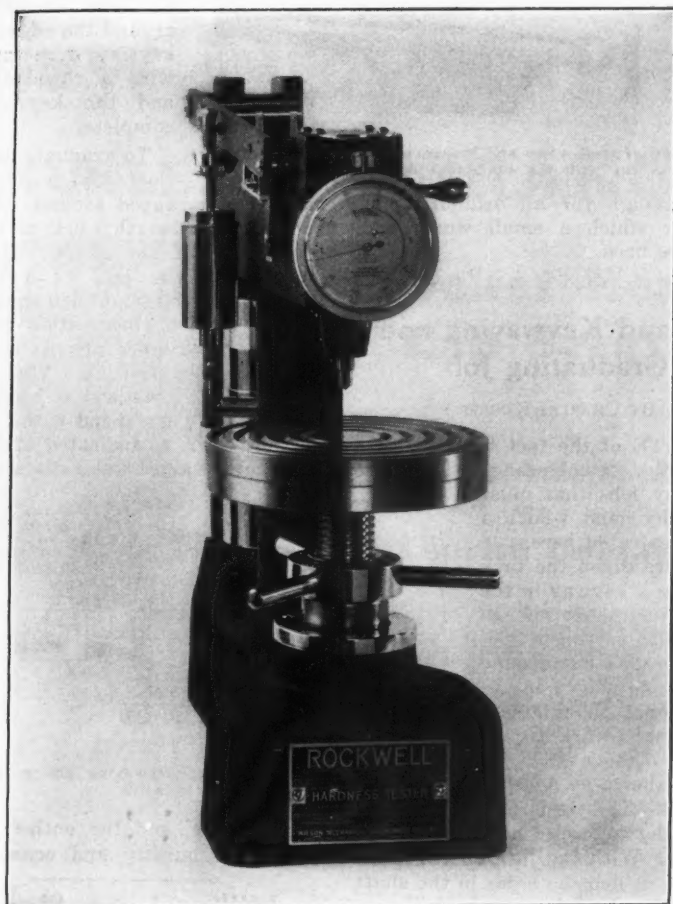
a shaft held in a small collet chuck on the spindle nose through a chain-and-sprocket drive to a pair of bevel gears. The drive sprocket is indicated as B-1, the driven sprocket as B-2, and the chain as C. The bevel gears are indicated at D. The shaft that carries the drive sprocket B-1 also drives the hob, A, thus the correct relationship between the hob and the work is maintained. The work-piece is hidden, in the illustration, by the hob. An idler, F, to which tension is applied by means of a spring, keeps the chain taut.

The work shaft M is held between centers, the upper one of which, E, is threaded through the upper member of the frame so that it can be locked in position. To change the work-piece this center is screwed out far enough so that the shaft M can be removed.

To cut a worm wheel, the slide rest is backed away and the blank is located on the shaft M.

The slide is then moved in, with the machine running, until the teeth of the hob have cut to the proper depth. The ratio of the sprockets and gears will have to be worked out to suit the requirements of the individual job. In the case under discussion, the blank made one complete revolution to 12 revolutions of the hob.

The equipment does not produce as accurate a job as could be produced with a hobbing machine, but the work was accurate enough, in this case, for the application. In fact, it is ac-



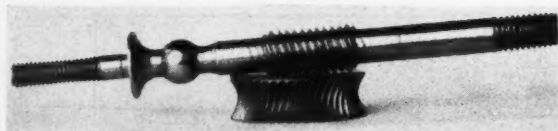
The right to stamp the value on money may be reserved to sovereign governments, but the right to say if steel has been hardened and tempered properly is reserved pretty much to the "ROCKWELL".

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Full-size view of steel worm and bronze worm-wheel. The wheel was cut with the equipment described here.

curate enough for all ordinary purposes for which a small worm and wheel are used.

A Hand Keywaying and Graduating Job

BY CHARLES KUGLER

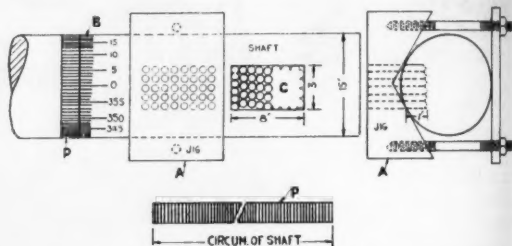
IN SPITE of the fact that this is a so-called "machine age", there are still many jobs that must be done by hand. Such a job is illustrated here.

We were given the task of cutting a keyway in the main drive shaft of an engine, also cutting a 360-degree graduation around the shaft as shown in the illustration. To eliminate as much hand work as possible we made a drill jig, vee'd as shown at A, to fit the shaft. The jig is provided with two tapped holes for clamping bolts. With the jig clamped to the shaft, we drilled the holes in the shaft by using a portable electric drill.

After the holes had been drilled to the correct depth with a drill ground to the usual taper at the point, the operation was repeated with a drill ground flat at the point, smoothing up the bottoms of the holes. Then after having drilled one set of holes, the jig was shifted half the diameter of a hole and the operation was repeated, thus cutting away the metal between the holes and leaving the keyway in the condition indicated at

C. The excess metal around the edges of the keyway were cut away with a chisel and file and the keyway was complete.

To graduate the shaft correctly, a strip of paper was wrapped around the shaft and cut to a length equal to the circumference of the shaft. Then the paper strip was laid on a drawing board and divided into 360 equal parts with a section liner, after which it was again wrapped around the shaft and pasted in position. With a fine, sharp chisel, graduations were cut in the shaft to correspond with the lines on the paper, as indicated at B. The accuracy obtained was satisfactory for



Drawing showing method of keywaying and graduating a shaft by hand.

the purpose, and the entire job was completed quickly and economically.

Milling Long, Slender Lead Screws

BY JOHN A. HONNEGER

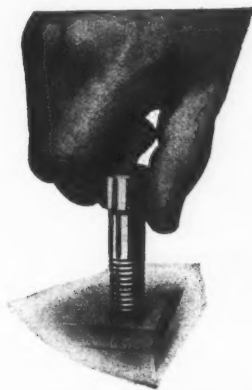
THE writer was recently called upon to make several long, slender lead screws similar to the design indicated in the illustration Fig 1. Although the quantity was not large, it was indicated that small lots of the screws would be processed at regular intervals. The stock was cold drawn monel metal.

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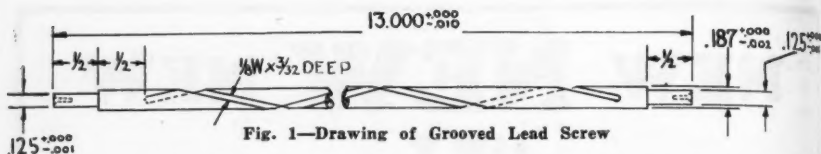


Fig. 1—Drawing of Grooved Lead Screw

The job was divided into two operations. In the first operation the ends of the screw were turned and centered, and in the second the lead screw slot was milled, for which a Brown & Sharpe milling machine was

block B was made with elongated bolt holes as shown at C and attached to the under side of the casting by means of the bolts G. Through the brass block a hole D was bored to a sliding fit for the lead screws. In the side of the block facing the machine column an opening was milled to provide access for the cutter E to the work, as shown in Figs. 2 and 3.

To operate, a lead screw was inserted through the hole D in the block B and then positioned between the milling machine centers. The screws G were loosened just enough to allow the block to slide horizontally and thus center the hole in the block with the work, the hole having been machined on the exact center

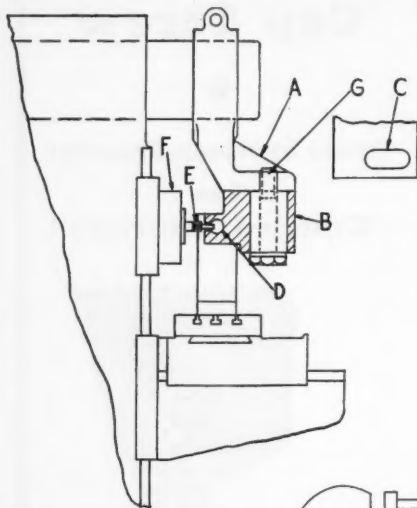


Fig. 2—Illustration of set-up for milling grooves in the lead screw shown in Fig. 1.

used, geared to the correct lead. Owing to the small diameter of the rod, as opposed to its length, it was essential that the rod be supported in the milling machine at the point of contact with the tool. To accomplish this, a special casting was made and machined to fit the over arm of the miller as shown at A in Fig. 2. A brass

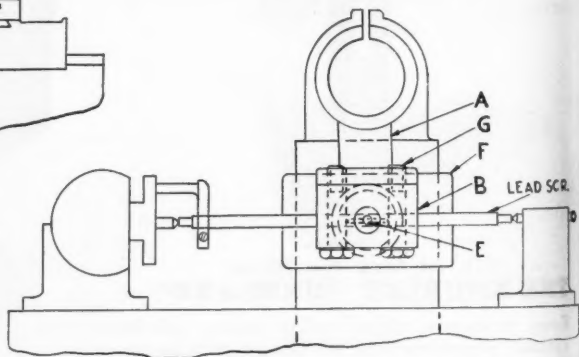


Fig. 3—Front view of set-up.

vertically. With the cutter revolving, the table was fed in, carrying the work, until the cutter had cut into the work to the proper depth of the keyway. As the table moved in toward the machine column it carried the block B with it, and when the

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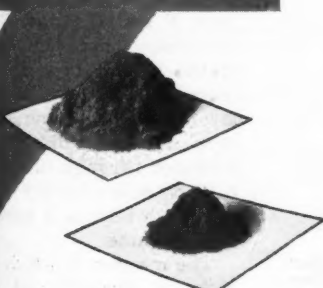


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Above piles of filings are from Duplex machine test. Material tool steel. Both files were run 3633 strokes. Delta (1 side) removed 189 grams. Brand "B" (3 sides worn out), 87 grams.

DELTA FILE WORKS

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full depth of the cut was reached, the bolts G were tightened. The longitudinal feed of the table was then engaged and the full length of the slot was milled.

The proper lead was obtained through the use of a dividing head, geared to the table feed, in the usual manner. This equipment worked so well that it was possible for an apprentice to operate the machine without difficulty.

Ingenious Strip-Feeding Mechanism for High Speed Automatic Nut-Blanking and Tapping Machine

By J. E. FENNO

THE small square brass nuts used in the manufacture of electric switches are made from strip stock in a high speed machine which blanks

the widths of the nuts across the flats. Therefore, to provide a more positive feed, the mechanism shown in the illustration was used.

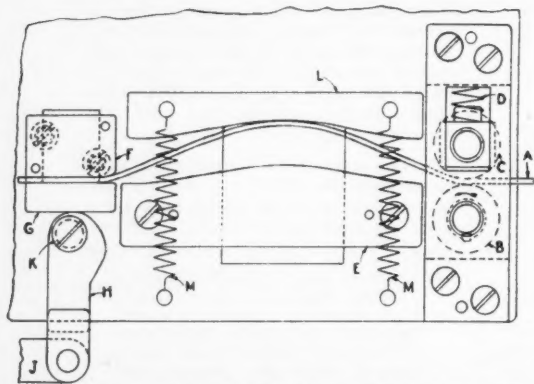
With this arrangement, the strip is fed at a constant linear velocity by means of a pair of rotating rolls which are pressed tightly against the strip. The path of the strip is curved so that the material is deflected, forming a slight bow which is enlarged to the limit of the space available when the strip is held stationary at one end while force is being applied at the other.

As shown in the drawing, the strip indicated at A is being fed toward the left by the action of the rolls B and C. Both of these rolls are positively driven by a gear (not shown) and the upper roll is pressed down against the strip by the action of the stiff coil springs D, one of which is located on each side of the roll C.

As the strip passes through the rolls, it is deflected by the curved stationary block E, giving it a slight curve which is augmented when the strip is gripped between the jaws F and G. Jaw F is stationary, but jaw G is of the sliding type and is forced upward by the cam lever H. This lever, pivoted at the point K, is actuated through link J by a cam member (not shown) which is a part of the machine.

The manner in which the strip is straightened out to feed the left end

of the strip into the machine is unusually interesting. Rolls B and C are constantly feeding the strip forward, while the jaw G is opening and closing continually. Each time the jaw closes, the rolls force the strip in at the right end, the pressure thus



Drawing of Ingenious Strip-Feeding Mechanism for High Speed Automatic Nut-Blanking and Tapping Machine.

the nut, taps it, and cuts it off. Because of the rapid feed required to keep the machine supplied with material, the ordinary friction or roll feed proved inadequate. The difficulty was due to the creep or slippage of the strip, which resulted in variations in

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applied springing the strip away from the curved block E and up against the sliding stop L.

The strip continues to bow until the jaw G is released by the cam lever H. As the jaw G is released, the tension of the strip forces the left end of the material through between the jaws and into the machine and at the same time the springs M draw the stop L downward. The result is that the stock is fed into the machine the required distance. The jaws then close and the bowing action of the strip against the stop L is repeated.

In order to obtain close adjustment of the feeding rate with respect to the width of the nuts, the cam member operating the link J is provided with adjustable dwell. Thus the time during which the jaws remain open may be varied, allowing the rolls to feed as much of the strip into the machine as may be required.

A Handy Light for Inspection

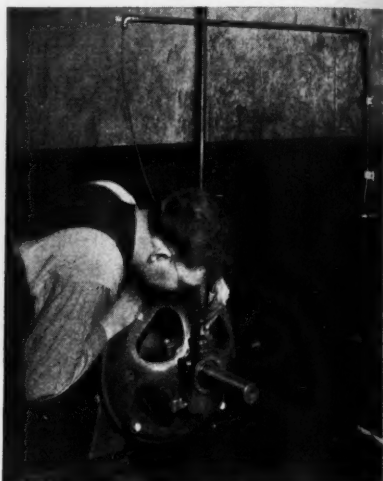
By J. W. GREVE

THE inspection of the interiors of motors and similar equipment is frequently a problem unless some method can be found whereby the inspector can illuminate the interior of the work. This problem was met at the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company by installing a miniature spot light, attached to the lighting circuit.

The light was made from a pocket "fountain pen" flashlight of a type that can be found in the stores practically anywhere. Instead of batteries, however, the light is attached to a flexible cord and arm in a convenient position over the inspection bench, current being supplied through a small transformer mounted on the wall. When not in use, the light

may be placed in the receptacle at the end of the arm and swung aside, out of the way.

As the ordinary extension light is rather cumbersome and is too large to be inserted through the small openings in the end plates and other small apertures, this light has proved



Inspecting a motor bearing with a peep-hole light at the Westinghouse plant.

to be a time saver on the inspection bench. It enables the inspector or repair man to thoroughly inspect the bearings, oil rings, and small parts of motors and other equipment without disassembling.

Grouping of Samples By Types

By GEORGE LAIDLER

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this reason many factories still retain the system of keeping a "sample" or reference piece of every part they manufacture.

In many cases the system that naturally arises from small beginnings is that of storing these samples with reference to their catalogue numbers, in alphabetical or numerical order, or both. We have superseded this arrangement, which had been the custom for years, by that

of classification by type. The labor of making this change in the storage of many thousands of castings, forgings and sheet-steel samples has been decidedly worthwhile because of the following time-saving advantages:

1. It aids the standardization of parts and corresponding tools by making comparisons easy when new parts and tools are under consideration.

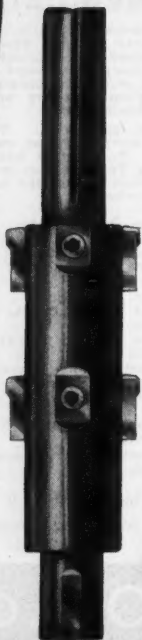
2. The comparison of a new part with similar parts makes possible a good estimate of its cost and piece-work price.

3. By making a survey of the racks carrying the group to which it belongs, it is a simple matter to determine whether a piece about to be scrapped can be salvaged by conversion into another part, as by shortening, filling a hole, etc.

4. When the catalogue number of a piece in question cannot be deciphered or is not known, reference to its group makes its identification easy.

The system described here has been found extremely convenient for many general purposes.

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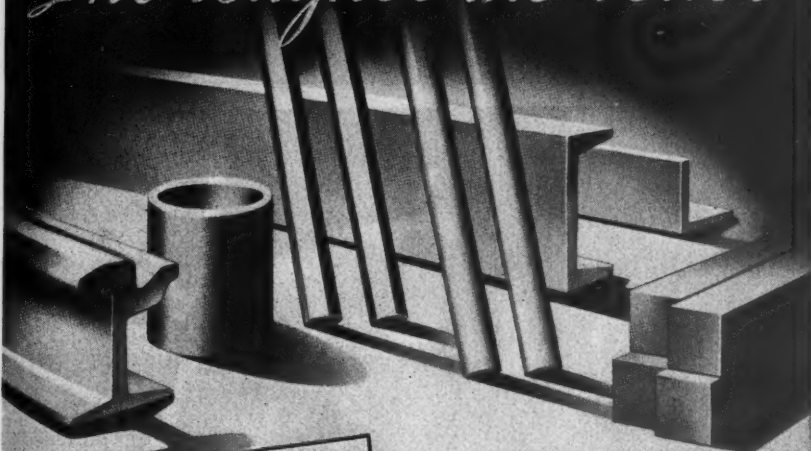
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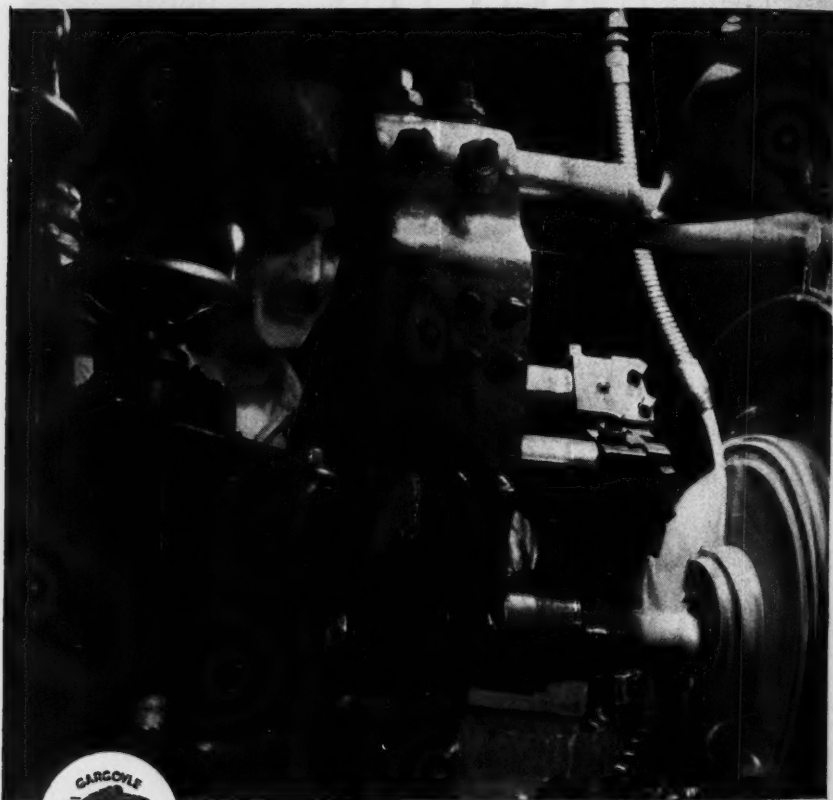
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Over the Editor's Desk

The Mapi Survey

INFORMATION that is of especial interest and value to the manufacturers of this U. S. A. is contained in the survey made by the Machinery and Allied Products Institute during recent months. The "MAPI" consists of associations of manufacturers who build machinery of various kinds—locomotive manufacturers, machine tool manufacturers, mining machinery manufacturers, and so on—58 of which have combined to form the Institute. Any report made by this Institute must, therefore, represent the best thought and ability available in nearly all, if not quite all, the entire metal-working and mechanical industries.

The survey was made to determine the extent to which recovery from the recent depressed condition has been dependent upon the employment situation in the capital goods industries. In times of uncertainty, the purchase of capital goods—mostly equipment—declines sharply, and the process of obsolescence accelerates. Decline in the purchase of capital goods is attributable largely to the decline in the demand for consumer goods; however, while the production of consumer goods declined 20 per cent during recent years, capital goods production in many industries declined 80 per cent.

Questionnaires were sent to all member companies of the various associations requesting figures as to the amount of equipment, interpreted in dollars and cents, that would be needed if business were restored to normal. When the figures were tabulated, it was found that the total amount of potential orders was \$18,574,632,000. Inasmuch as it is estimated that 65 cents out of every dollar, on the average, paid out for

industrial machinery and equipment goes to labor in the form of wages, a simple

mathematical calculation will show what this pent-up stack of orders would mean to labor. Sixty-five per cent of \$18,574,632,000 is over \$12,073,000,000—a twelve-billion dollar order to labor.

What would \$12,000,000,000 mean to labor? Estimating that the average hourly rate of pay in the machinery industries is 60 cents an hour, these twelve billions of dollars would purchase, on a basis of eight hours a day and six days a week, the labor of 8,000,000 men for one year.

With inventories at the lowest ebb and with a large part of the nation waiting only for jobs in order to be able to buy clothing, shoes, furniture, and a thousand other things necessary to every-day life, if these 8,000,000 persons can be put to work for a year there can be no doubt the year will lengthen to several more.

Appended to the MAPI survey are the following reasons why plant equipment should be bought now:

1. Prices are at their lowest. Machinery cannot be sold for less than it is being sold for at the present time, and increased demand will eventually bring about a rise in prices.
2. Funds. Firms who have liquid funds drawing a low rate of interest could better invest these funds in their own plants. Furthermore, credit is becoming easier.
3. Skilled mechanics to build and install machinery are more plentiful now than they will be later.
4. Machinery can be installed now without disturbing plant routine. The time required to install new foundations, for instance, and the consequent disturbance to plant operation mean relatively little in slack periods but constitute a tremendous handicap in time of flush demand.
5. Keep the present force busy. Many manufacturers have retained on their payrolls competent men for whom they really have insufficient work. These men can be used to remove old machines and install the new, making a direct saving.
6. No delay in delivery. During quiet times orders are given immediate attention and delivery is prompt.
7. Preparedness. Plants not efficiently equipped cannot expect to be able to bid for business against competitors who, because they have modern machinery, are able to produce at lower costs.

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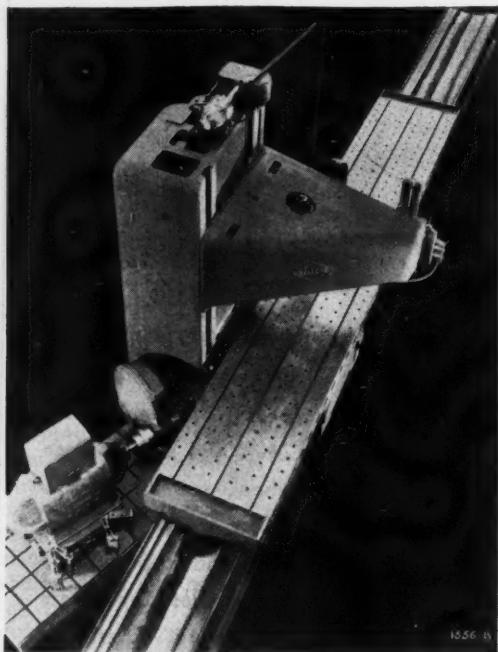
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NEW SHOP EQUIPMENT

Sellers Openside Planer

Wm. Sellers & Co. Inc., 1700 Hamilton St., Philadelphia, Pa, have developed an entirely new and advanced design for openside planers of 60-inch size and larger. Many novel features have been



Birdseye view of Sellers 60-In. x 60-In. x 30-Ft. Openside Planer. Note the huge steel crossrail brace. The lifting motor and mechanism are mounted on top of the housing.

worked out to simplify the operation and improve the performance of the machine.

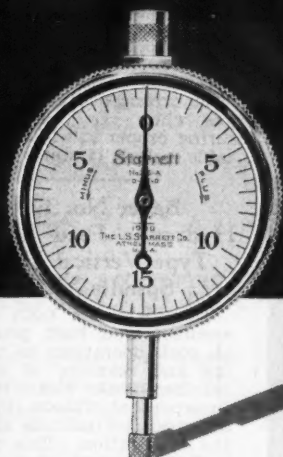
As may be noticed from the illustration of the 60-in. x 60-in. x 30-ft. machine, the design is unusually free from unsightly projections. There are no operating levers except those for hand motions and all control is by means of "built-in" push buttons and switches.

The bed and table are extremely deep and heavy. The drive from the motor to the table is by spiral pinion, rack, and one pair of helical gears. The driving motor, which is rated at 100 h.p. at 40 ft. per min., has 10-to-1 speed range, providing cutting speeds of 20 to 200 feet. Limit switches for automatic reversal have eliminated the necessity for any shifting levers or mechanism which might be a possible source of trouble at high speeds.

The housing is exceptionally massive, providing a rigid support for the crossrail. The crossrail is made in two pieces; the front face, upon which the heads travel, and the rear brace, which supports the front face. The two pieces are bolted and doweled together with provision for realignment if necessary. The brace is of welded steel, to provide maximum rigidity with minimum weight. Powerful clamps operated by a torque motor through toggle mechanism hold the rail rigidly to the housing, pulling it back against the housing face as well as holding it securely in alignment. When the clamps are released, the weight of the rail and brace are taken on a hardened steel block on the outside lip of the housing face.

The rail and side heads are of the same size and of extremely heavy pattern. Micrometer dials are provided at the heads and at the ends of the rail. All heads are equipped with electrically-operated tool lifters built into the slides. The lifters are operated from the limit switches for reversing the table, and may be engaged or disengaged by small tumbler switches located in the rheostat panel. Reels carry the cable from the top of the housing to the rail heads, keeping the wire taut at all times so that it cannot get tangled or caught on the work.

One of the novel features of the machine is the simplification of the feed and traverse mechanisms by means of electrical apparatus. Each head has its



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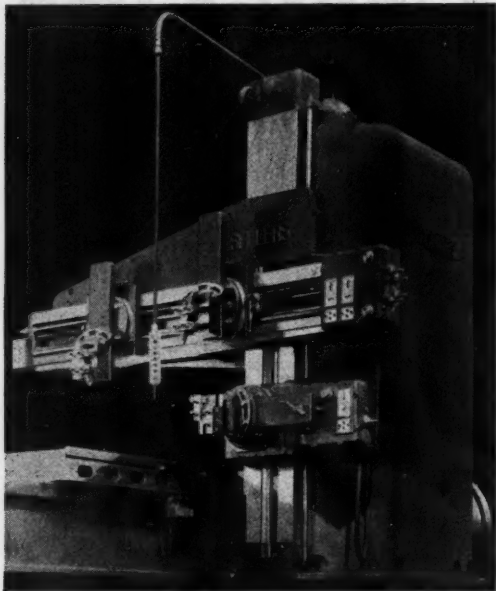


Starrett Dial Indicators

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own motor, which provides both feed and traverse. A worm, worm wheel, and one pair of spur gears connecting the motor to the screw and spline shaft constitute the entire mechanical part of the mechanism. The electrical parts including a Westinghouse measuring relay, two magnetic clutches, two elevator car switches for feed and the necessary push buttons for traverse. All the

feed motors for the heads, the lifting motor, clamping motor, oil pump motor, tool lifter, and magnetic clutches are all controlled from one panel which is provided with the necessary interlocks and protective devices for carrying out the various operations. The motor for the oil pump is so arranged that it automatically starts when the line switch is closed, insuring proper lubrication to the table before it starts to move.



The housing of the Sellers Openside Planer is extremely massive. The simplified crossrail mechanism permits the housing to be of such shape as to provide maximum rigidity to the face.

electrical parts are built into the mechanism boxes; not added to the outside.

The independent motors permit traversing any head while others are being fed. The electrical control is so arranged that while the feed is engaged for any movement, the traverse can be operated in any direction without interfering with the feed. Stainless steel dials are provided for setting the amount of feed. When several heads are operated simultaneously, each may carry a different amount of feed.

The machine is equipped, altogether, with seven motors. The main driving motor has its separate control panel of the standard planer type. The three

Baker No. 30-HO Hydraulic Feed Simplified Type Vertical Multiple Spindle Machine

To provide for both extreme accuracy and high production on such operations as the boring and reaming of holes in cylinder blocks, Baker Brothers, Incorporated, Toledo, Ohio, have designed the machine shown in the illustration. This machine is of the vertical type, equipped for hydraulic feed, power being supplied by a pump which provides for very fast rapid traverse speeds and an automatic cycle. The machine was designed with a view to adapting large multiple heads to the main column, consequently the main column is sufficiently rigid to insure accuracy regardless of the overhang of the large heads.

The machine as shown in the illustration is equipped for the second boring and reaming operations on valve guide holes and for finish boring valve throats and chamfering the valve seats on a six-cylinder motor block. Extreme accuracy and high production are required on these operations.

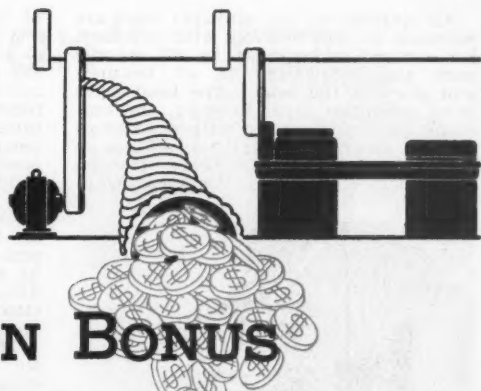
The main frame of the machine is well ribbed to insure rigidity and is mounted on a one-piece steel base which is also heavily ribbed to maintain the accurate relation of the spindle, table, and work. The saddle, upon which the head bracket is mounted, is 40 inches long and is arranged with taper take-up gib between the ways of the main frame. The head bracket is of ample size to allow for mounting a multiple head of 18 x 26-inch size. The motor for driving the spindles is mounted on the saddle bracket with a direct-coupled drive to the main drive shaft in the multiple head. The two motors on this machine are standard.

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Research Belt Dressing

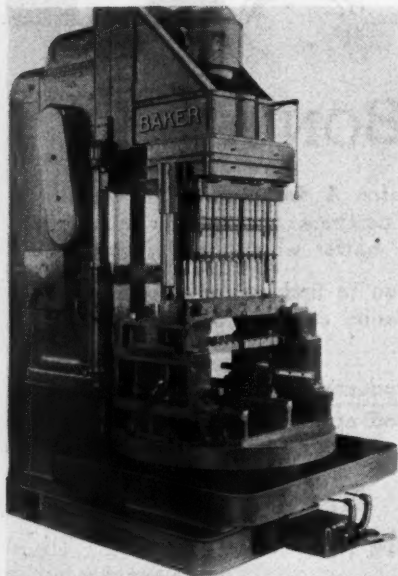
Prices: qt. \$1.00; 1/2 gal. \$1.50; gal. \$2.75;
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. . . whose Home of Research serves "so that Power Transmission shall be better" and whose service is set up through the country to operate "with telegraphic speed".

All spindles in the multiple head are mounted on ball bearings with provision for vertical adjustment in all spindle ends and lubrication to all bearings and gears in the head. The head drive is of simplified type; however, the machine may be furnished with a standard bracket mounted on the top surface of the column, the bracket being arranged with pick-off gears in the speed train



Baker No. 30-HO Hydraulic Feed Simplified Type Vertical Multiple Spindle Machine.

to allow for changing of speeds to the main vertical drive shaft.

The cycle of operations is automatic and the feed control is simplified accordingly. The operation cycle is as follows: rapid traverse of head to work; coarse feed for the second boring and reaming operations; automatic change to a finer feed for chamfering of the valve seats; dwell at end of chamfering operation; automatic return of the head to the upper position. The machine is started in cycle by means of a foot treadle and automatically stops when the cycle is completed. The travel of the machine illustrated is 16 inches but the same model machine can be furnished with increased length of travel. The Baker "Twin-Pull" cylinder construction is incorporated in the design

of the No. 30-HO machine.

A two-station table, arranged for chucking two blocks, is mounted on the table of the machine. The table is indexed by hand, the control of the index plunger and the locating of the table in position being accomplished by means of a second foot treadle in the base of the machine. The tools are supported above by bushings of ample size and are piloted at the lower ends to insure accuracy. The cylinder blocks are located in the fixture by two dowel pins of the disappearing type, controlled by a lever mounted on the side of the fixture. The block is held in place by clamps at either end, convenient to the operator.

The pump mounting and direct coupled control have been arranged to reduce the amount of piping to the minimum. Every effort has been made by the designers of this machine to insure continuous operation with a minimum of up-keep. The machine can be furnished with column heads to meet the customers specifications. Extreme flexibility is provided for adapting various types and sizes of heads.

Bodine No. 48 Dial-Type Drilling and Tapping Machine

The No. 48 Bodine Dial Type Drilling and Tapping machine shown in the illustration has been built by the Bodine Corporation, 1720 Fairfield Ave., Bridgeport, Conn., in response to a demand for a heavier machine than has previously been available. This machine has a capacity of four $\frac{1}{2}$ -inch drills and two $\frac{1}{2}$ -inch taps in mild steel, the taps being advanced and reversed by an oscillating segmental gear. There are no friction drives on the mechanism to be replaced.

The slide has a maximum stroke of 4 inches. The spindle speeds can be varied to suit the work to be done. The standard machine provides a maximum of 19 turns on the tapping spindles. Special gears can be provided to increase the turns where necessary.

The spindles are all ball and roller bearing and will take speeds up to 6000 r.p.m. Each tap spindle carries its own compensator, thus allowing different pitch threads to be tapped simultaneously. The drill spindles carry a vertical adjustment for depth of hole and each spindle is adjustable for position.

The machine is built as a dial tapping machine, as a dial drilling machine, or as a combination dial drilling and tapping machine. Two sizes of knee are standard—a 20-inch and a 30-inch. The

"ROTAPISTON" PUMPS

Built By
GLOBE PRODUCTS Co.
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Cleveland, Ohio



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"NORMA-HOFFMANN" **PRECISION BEARINGS**

These improved pumping units, employing two double-acting reciprocating pistons working in a revolving element, have no valves and give the continuous flow of a rotary pump. Extreme simplicity of construction and high efficiency are their outstanding characteristics. Norma-Hoffmann Precision Ball Bearings (shielded type) carry the rotating load.

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NORMA-HOFFMANN BEARINGS CORP'N, Stamford, Conn., U. S. A.

knee is provided with finished pads for the attachment of horizontal spindles (either drilling or tapping) or hopper feeding mechanisms.

The drive is from a motor mounted on an adjustable bracket at the rear base of machine through a multiple Vee-belt to the main pulley mounted on the

for drilling and tapping. This machine produces gas pump covers of die cast material at a rate of 22 pieces per minute with one operator.

Hobart 75 Ampere Arc Welder

The new 75 Ampere Hobart Arc Welder illustrated here-with and now announced by the Hobart Brothers Company, Troy, Ohio, is said to be the result of two years experimental and practical development. The manufacturer points out that it embodies practically the same design and construction as the larger Hobart models and includes the same equipment.

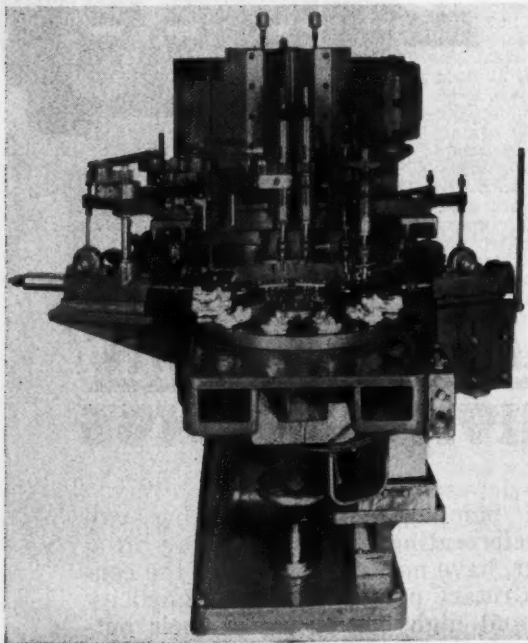
Rated at 75 amperes, 25 volts, being designed especially for light gauge welding, it has a welding range of 15 to 125 amperes in three steps and performs exceptionally well on 24 gauge and heavier, using 1/16, 3/32 or 1/8-inch electrodes, either bare or coated. It is powered by a 3-h.p. electric motor.

This model, which is expected to find acceptance in plants working with light gauge metal, comes completely equipped with a starting switch, polarity change switch, dual remote control, double reading voltmeter and double reading ammeter. It is provided with a convenient lifting eye on top and in the portable type (illustrated) is

bolted to a sturdy, welded steel truck with four steel disc wheels and drawbar, making it very easy to move about. It is easily demountable from the truck when desired, the reactance unit being enclosed in the attractive, pressed steel "turret top".

The volt-ampere curve of this machine approaches the vertical far more nearly than in connection with the larger machines, since it is especially intended for low current values. The arc is extremely tenacious, even down to the very minimum current with which it is practical to weld.

The machine is of arc welded steel construction throughout and there has been no skimping in all-important copper and electrical sheet, both the weld-



Bodine No. 48 Dial-Type Drilling and Tapping Machine

worm. Speeds from 10 to 35 strokes per minute are possible, depending on work to be processed. The coolant is circulated by a pump from a reservoir in base of machine to the cutting tools.

All moving parts are adequately guarded to prevent accidents to operators. The machine weighs from 4000 to 5500 lbs. depending on size of knee and number of spindles furnished. It requires floor space approximately 3 1/2 feet x 8 feet exclusive of operator and work space.

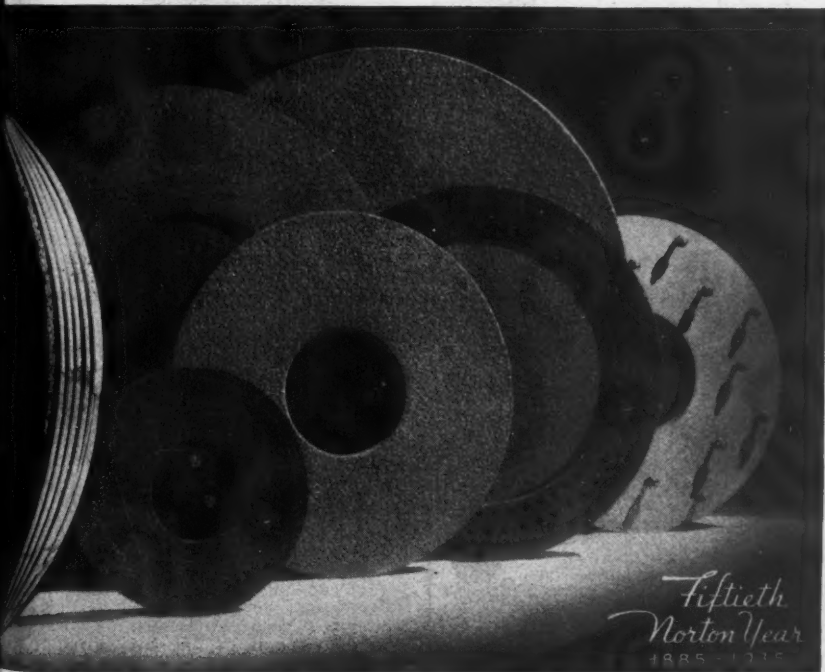
The machine illustrated with all guards removed is equipped with two horizontal and two vertical drilling spindles and two horizontal and two vertical tapping spindles. The dial indexes the parts as it revolves presenting first one end and then the other to the horizontal spindles

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FAVORITE
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Head does not leave the nut until operation is completed. Works on a quick straight-ahead ratchet movement. Reverse motion instantaneous by simply turning pawl. New metal in all parts enables the "Favorite" to withstand harder and rougher usage.

A TIME SAVER

*Skinned Knuckles
Avoided and
Time Saved*

*Head
Cannot
Slip
Off
Nut*



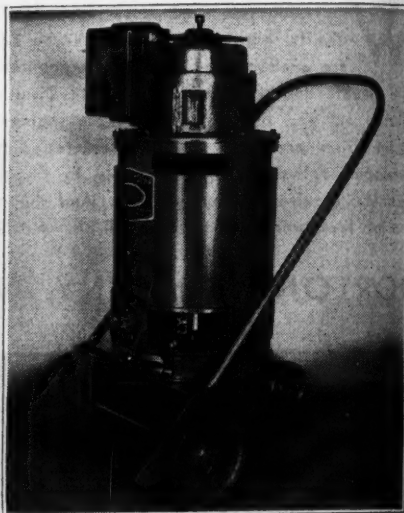
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ing generator and the inbuilt exciter being of ample size and with ample brush capacity. The motor is also of rugged design with arc welded rotor bars and with stator ground concentric with bearings to insure a uniform air gap.

Motor, generator and exciter, with special cooling fan, are carried on a single, heavy-duty, horizontal shaft with



Hobart 75-Ampere Arc Welder

ball bearings mounted at the ends, just as in the larger Hobart models. The long-life, economical speed of 1750 r.p.m. is also maintained in this machine.

Eisler Air-Operated Electric Spot Welder

An electric spot welder which utilizes air pressure for closing the electrodes upon the work has recently been developed by the Eisler Engineering Co., 742 So. 13th St., Newark, N. J. The air-operated type is the latest addition to the popular line of foot-operated and motor-driven welders manufactured by the above company.

Available in sizes from 5 to 75 K.V.A. and capable of welding metals up to 0.750 inch in thickness, the new air-operated welders, because of the particular design of the air cylinder, require a very small volume of air for

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"There are twelve perfect files in every dozen." That assurance of uniformly high quality is enough to explain why Nicholson Files are recognized as the big value by executives throughout Industrial plants and by men on Production Jobs. But there are other reasons. An important one is the fact that Nicholson Files are **PRICED TO MEET THE CONDITIONS IMPOSED BY 1935 BUDGET CONTROLS.**

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Genuine

NICHOLSON FILES



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Hundred
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Showing different Haskins models, illustrating scores of uses for which this equipment has been adapted. It will give you many ideas for cutting costs and speeding up production.

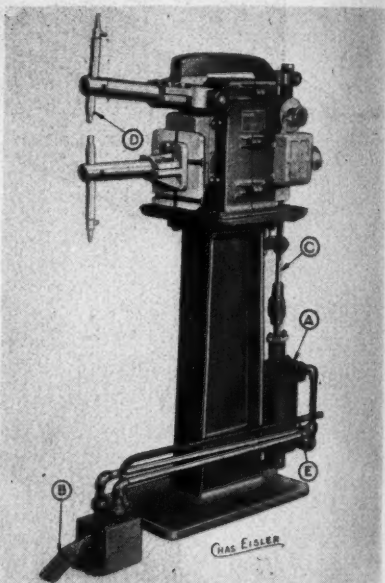
Haskins

FLEXIBLE SHAFT EQUIPMENT
with Greater Adaptability

their efficient and economical operation. Air pressures up to 80 pounds are used; the pressure depending upon the size of welder used. An air operated spot welder of 20 K.V.A. capacity is shown in the illustration.

Upon pressing the foot controlled valve B, air from the supply line E is admitted into the cylinder A. Pressure of air upon the piston within imparts motion to the electrode D through the vertical drive shaft C.

The use of air operated welders not

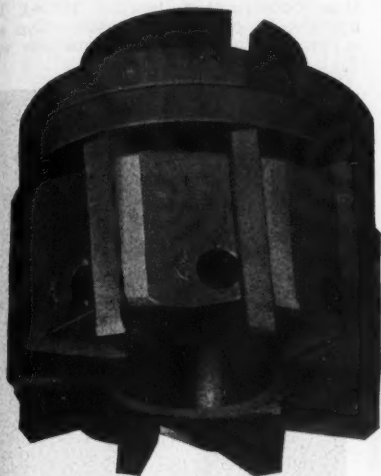


Eisler Air-Operated Electric Spot Welder

only relieves the operator of supplying the force to bring the electrodes together, but permits, by means of a regulating valve in the supply line, exact regulation of electrode pressure upon the work, an essential factor for the production of uniform welds.

Diamond 8x4x10-in. Knee Action Surface Grinding Machine

The Diamond Machine Co., 7 Coddling St., Providence, R. I., has added to its line of surface grinding machines the 8x4x10-inch knee action machine shown in the illustration. The machine is especially intended for the grinding of



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Cam lock serrated blade reamers are designed about the following features.

Efficiency . . .

Quickly, easily and positively adjusted. Designed to give smooth holes, accurate for size and concentricity.

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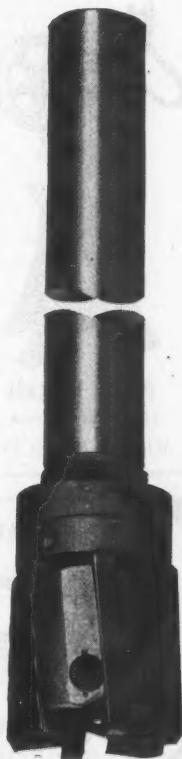
$\frac{5}{8}$ inch grinding life on the diameter of the larger sizes. Smaller size proportional.

Economy . . .

Grinding life at 2c per .001 in.

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Co., Inc.**

Detroit, Michigan

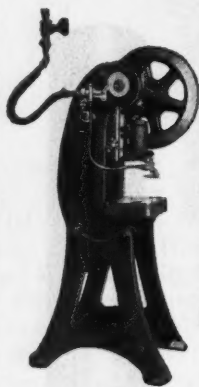


tools, dies, and other machine parts of small size and fine accuracy.

The machine is said to be of unique design, inasmuch as the cross-feed is obtained without the usual intermediate table or the alternative moving spindle housing. The table rests directly upon a ground plane surface on the bed and is guided longitudinally and laterally by a special knee-action control, which is said to provide a high degree of accuracy and finish. Play is eliminated and there is only one oil film subject to the grinding pressure. The way is covered by guards at all positions of the table.

The bed of the machine is of box-type construction heavily ribbed. The upright is of sturdy construction and is provided with three generous ways

AN IMPROVED AIR BLAST VALVE AND JET FOR PUNCH PRESSES



This large capacity valve can blow 5 ounce pieces with 50 lbs. pressure. Its Jet has a universal clamp which facilitates quick adjustment.

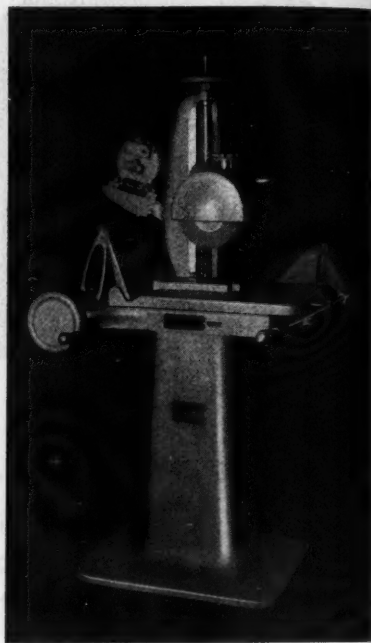
Valve is furnished with or without Jet, Bracket, & Hose.

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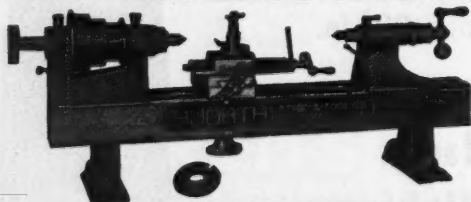


Diamond 8 x 4 x 10-Inch Knee Action Surface Grinding Machine

on which the saddle is moved vertically by means of a conveniently-located handwheel.

The saddle with its spindle housing has adequate mass to absorb vibration

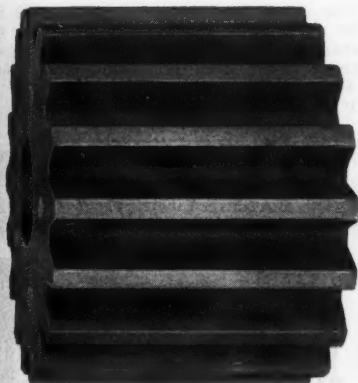
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- The Union Gear & Mch. Co.
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- The Atlantic Gear Works
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- Chicago Rawhide Mfg. Co.
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- Perfection Gear Company
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Mfg. Co., Chicago, Ill.
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Cincinnati, O.
- The Horsburgh & Scott Co.
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Co., Cleveland, O.
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Dayton, O.
- The Adams Company
Dubuque, Ia.
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Gastonia, N. C.
- Hartford Special Mch'ny. Co.
Hartford, Conn.
- Beatty Machine Works
Keokuk, Ia.
- The Generating Gear Co.
Milwaukee, Wis.
- Badger State Gear Co.
Milwaukee, Wis.
- Precision Machine Co.
Milwaukee, Wis.
- E. A. Pynch Co.
Minneapolis, Minn.
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Havana, Cuba
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Philadelphia, Pa.
- Rodney Davis and Sons
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- The Pittsburgh Machine &
Supply Co., Pittsburgh, Pa.
- Standard Gear Co.
Pittsburgh, Pa.
- H. W. Honeyman & Son
Providence, R. I.
- Perkins Machine & Gear Co.
Springfield, Mass.
- Winfield H. Smith, Inc.
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- Arlington Machine Co.
St. Paul, Minn.
- Farwell Mfg. Co.
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- Diefendorf Gear Corp.
Syracuse, N. Y.
- Worcester Gear Works
Worcester, Mass.
- Massachusetts Gear & Tool
Co., Woburn, Mass.

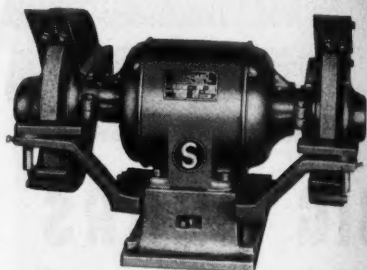
and is equipped with a clamping mechanism of special design. After approximate adjustment of the wheel to the work, the saddle is clamped rigidly to the upright. Micrometer feed is then used to obtain adjustment to extremely fine accuracy. The saddle carries the spindle housing on special hinged bearings that are completely guarded. The spindle itself is equipped with a plain taper front bearing and a rear ball radial and thrust bearing with spring take-up adjusting both bearings, eliminating radial and end play, thus automatically compensating for wear and always keeping the spindle in adjustment. Play and vibration are eliminated, and this design, together with the knee-action principle, is aid to make possible fast stock removal combined with tool-room accuracy and finish.

The table platen has one tee-slot for $\frac{3}{8}$ -inch bolts. It is moved longitudinally by means of a hand lever at the right of the machine and laterally by a handwheel at the left. The machine has a work capacity of 8 inches longitudinally and 4 inches transversely with a vertical capacity from the table top to the bottom of a 7-inch wheel of 10 inches. The wheel is 7 x $\frac{1}{2}$ x 1-inch hole.

The drive is through a $\frac{1}{4}$ h.p., 110 volt, 60 cycle single phase 1725 r.p.m. constant speed motor, with V-belt drive to the spindle. The floor space required is 44 x 32 x 27 inches. Net weight, 295 pounds.

"Standard" 10-in. Special Bench Grinder

The Standard Electrical Tool Co., 1938-48 West Eighth St., Cincinnati, Ohio, has



"Standard" 10-In. Special Bench Grinder

placed on the market a Special Bench Grinder equipped with a grinding wheel

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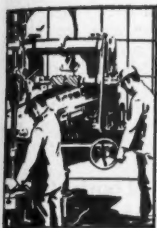


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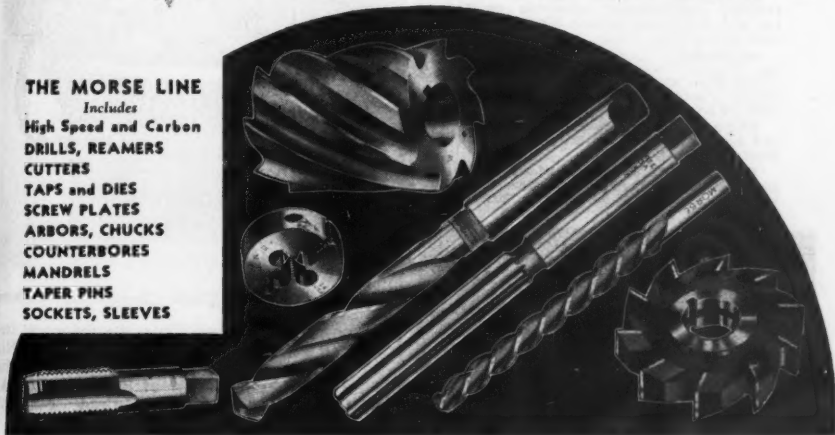


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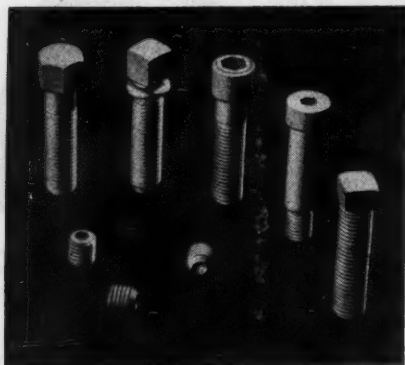
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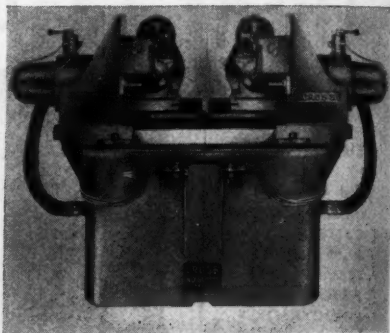
THE STRONG-CARLISLE and HAMMOND CO.

CLEVELAND, OHIO . . . NATIONAL DISTRIBUTORS

of 10-in. diameter with a 1-in. face. The machine is intended for use in shops where the grinding is not continuous, and is a supplement to the Standard line of heavy duty grinders. The machine can be furnished with a buffer extension in place of the grinding wheel on the right side.

Cross No. 51 Gear Tooth Chamfering Machine

The No. 51 gear tooth chamfering machine shown in the illustration is now being offered by the Cross Gear & Machine Company, 3250 Bellevue Avenue,



Cross No. 51 Gear Tooth Chamfering Machine

Detroit, Michigan. This machine is intended for the same purpose as the No. 50 machine which was announced in the February, 1935 issue of MODERN MACHINE SHOP, but the No. 51 machine is of the 2-spindle, 2-station type.

The specifications for the No. 51 machine are the same as for the No. 50 machine with the exceptions that the oil tank has capacity of 70 gallons, the floor space required is 54 x 61 inches, and the net weight of the machine is 7300 pounds.

New Art Automatic Cutting Press

A cutting press especially equipped for use in small jobbing shops, shown in the illustration, has been brought out by New Art Specialties, Inc., 2228 North Racine Ave., Chicago, Illinois. The press is 16½ inches high and 9 inches wide, and will cut materials to any predetermined length up to 9 inches and to any width up to 5¾ inches. It was especially designed for cutting to lengths such materials as paper, cloths, light metals, insulated materials or wire.

The feed is completely automatic and

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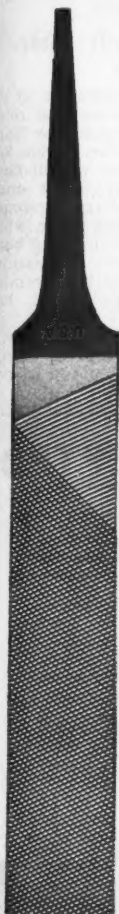
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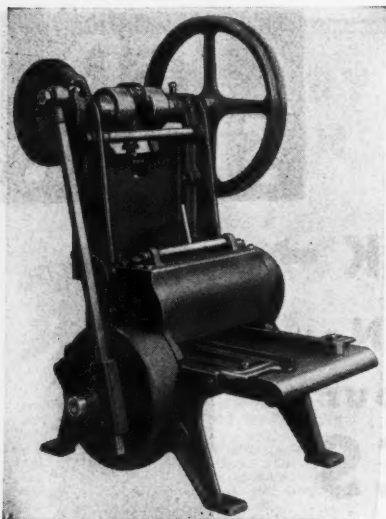
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**The Files with
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**High Speed Steel
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New Art Automatic Cutting Press
can be adjusted to any desired length.
Adjustments can be made as close as

0.020 inch. The locking device assures permanency of setting and the design of the feed mechanism insures that all pieces will be of the same length.

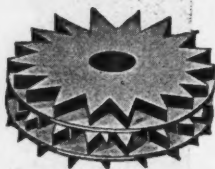
Blades are held in a special die set which is quickly and easily removable. Small dies may be inserted for continuous perforating, blanking, and separating. When equipped for power operation, the press will cut wire up to No. 20 at a rate of 12,000 pieces per hour.

Hamilton Auto-Shift Table Improved

Improvement and simplification of the Hamilton Auto-Shift drawing and reference table has been announced by Hamilton Manufacturing Co., Two Rivers, Wis.

The new series includes a full-floating, counter-balanced adjustable drawing board top, with mechanism simplified. Both the raising mechanism which controls the height of the drawing board and upon which the board is mounted, and the tilting device which determines the angle of the drawing board, have been improved.

In adjusting the board for height, a slight pressure on a foot lever releases the clamp holding the table top in position.



NATIONALLY ACCEPTED

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Desmond Dressers and Cutters and Simplex Steel Slide Vises are found in plants where quality and service are considered in tool buying. Most Mill Supply Dealers stock them for the same reasons.

They Have Their Place on Every Job

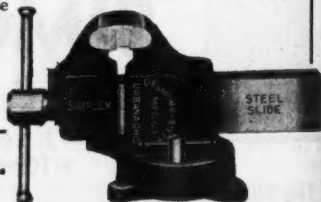
For over twenty-five years Desmond Dressers and Cutters have successfully been used on all sizes and types of Grinding Wheels. Let us advise you the proper dresser for your wheels.

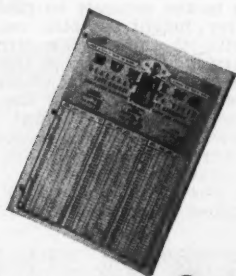
No Other Vise Can Offer These Advantages

In Simplex Vises you have an unbreakable, solid steel slide that will give you longer service at no added cost. Hardened steel, removable jaws and a one piece handle with tapered ends are added features for your convenience.

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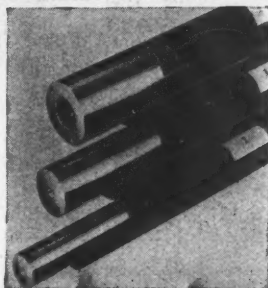
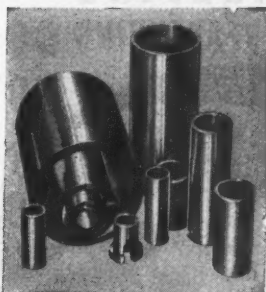
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121 Stock Sizes

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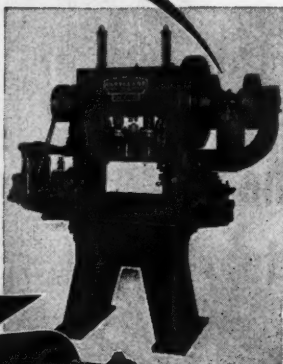
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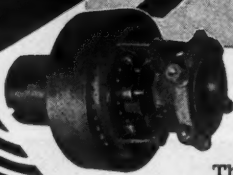


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Equipped



No. 8125
BFT-2-11 1/2
Twin Disc
Clutch



This Cleveland high speed double eccentric all-welded steel press can be operated up to 250 rpm. Two Twin Disc No. 8125 BFT-2-11 1/2 Duplex Cone Action Clutches, used in connection with a Twin Disc No. 8153-2 Type B Spider, are embodied in its design—one to pick up the load occasionally, as the press operates continuously, and the second clutch to act as a brake. With the selling price of the press so low, all parts had to be "production parts" to keep manufacturing costs below selling price. That's why the Cleveland Punch and Shear Works Co. of Cleveland selected Twin Disc Clutches—economy. Another reason is, of course, the all-around reliability of Twin Disc performance. Engineering data on request or write for specific recommendations.

Twin Disc Clutch Company, 1326 Racine St., Racine, Wisconsin

TWIN DISC
CLUTCHES

tion. The board may then be instantly raised or lowered to any height desired. When the foot lever is released the top is locked securely in place. The control over height enables use of the board with the draftsman either standing or sitting. The slant of the board may also be controlled, a rod underneath the front being depressed and the top released to be tilted to any slant desired. When level, the drawing board has a height adjustment of from 33 3/4 inches to 46 1/2 inches.

The table and board have been designed to be used in multiples. The rear

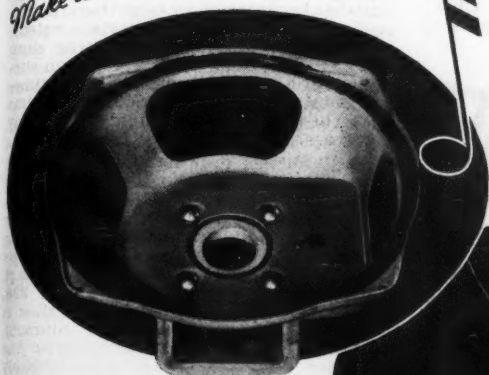


Improved Hamilton Auto-Shift Drawing Table

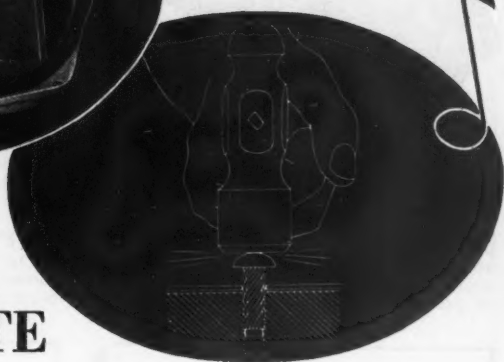
surface, or top of the base, forms a desk or reference table for the draftsman in front of the one using the table for drawing purposes, as in the illustration. Hence the Auto-Shift is really a drawing table and reference table in one. On the reference side there is a long shallow drawer and a tool drawer with a lock and tool tray. Drawers are made of wood with steel fronts to match the table.

Drawing board tops are of selected California sugar pine, varnished on both sides, with the top side sanded smooth. End cleats are of cadmium plated steel, and fit the new Hamilton parallel rule attachment, which is extra equipment. The table is available with three different sizes of drawing boards. Base of the table is of welded all-steel construction to maintain permanent rigidity and strength. The same size base is used for all three sizes of drawing boards. Metal parts are finished in olive green baked enamel. Extra equipment available includes dust covers, parallel rule devices and swing instrument cabinets.

Make it Better... Make it Cheaper with Hardened Metallic Drive Screws



Hardened Metallic Drive Screws speed work, cut costs in assembling Philco High Fidelity Speakers.



A HIGH NOTE of Assembly Economy tuned in by Philco

With Parker-Kalon Hardened Metallic Drive Screws, Philco "tuned in" a fifty per cent saving in fastening aluminum shells to cold-rolled steel speaker pots. Just as important to them, this high note of economy was reached without jeopardizing the fine quality of their receiver.

Actually the Hardened Metallic Drive Screws gave them more secure fastenings than machine

screws which would require slow and costly tapping. Driven into plain untapped holes by means of a hopper feed riveter, these unique Screws form a thread in the material and securely assemble the two units.

Try these cost-cutting Screws on your permanent fastenings to iron, brass and aluminum castings, steel, plastics, etc. See how easy they are to use . . . how

much time and labor they save . . . how securely they hold, even under great loads and vibration.

Write for FREE SAMPLES for your test. Just send a brief description of your fastenings and we'll furnish the correct Screws with recommendations of our Assembly Engineers.

PARKER-KALON CORP.
Dept. M, 198 Varick St., New York

PARKER-KALON TYPE "U" HARDENED METALLIC DRIVE SCREWS

PATENTED No. 1,461,191 - No. 1,512,222 - No. 1,579,145 - No. 1,579,320

TRY THESE, TOO



Type "Z" Hardened Self-Tapping Sheet Metal Screws
For joining and making fastenings to sheet metal up to six gauge; also aluminum, die castings, Bakelite, etc. Simply turn Screw into drilled, pierced or molded hole. It forms a thread in the material as it is turned in. Can be removed and replaced.

Hex Head Hardened Self-Tapping Cap Screws

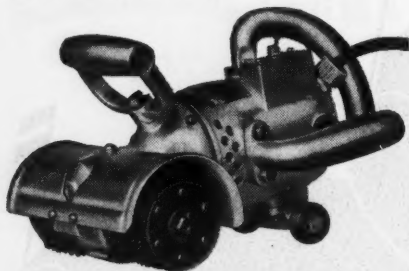
For making fastenings to sheet metal from 14 gauge to 10 gauge, and also to steel plates and structural shapes up to 1/4 inch thick, solid brass, bronze, die castings, etc. They function like the Type "Z" Screws but are driven with a wrench.



Parker-Kalon Products are sold only through recognized distributors

Berg Model M Cleaning Tool

The line of "Berg" Cleaning Tools made by the Berg Cleaning Tool Division of The Concrete Surfacing Machine Co., 4669 Spring Grove Ave., Cincinnati, Ohio, has been increased by the addition of a



Berg Model M Cleaning Tool

larger and more powerful tool to be known as the Model M. The tool is of the portable type, operates by power, and is intended for use in removing paint, rust, scale, and dirt from metal and other hard surfaces. The cleaning tool is made in two designs, for electric or pneumatic operation.

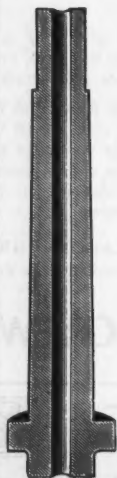
The tool consists of the power unit, to which is connected a shaft carrying two sets of cutters with 36 in a set, totaling 72 cutters. The cutters are milled from high grade tool steel and hardened. The cutters are projected by centrifugal action and this tool may, to a certain extent, be used in place of sandblasting since the cutters contact the steel or iron surface with a shearing action 115,000 times per minute. The manufacturer claims that the tool will thoroughly clean any surface.

The tool has four handles, designated as the rear grasp handle, front spade handle, and side grip handles. Thus pressure can be applied in any manner or position best suited to the job. The housing is of aluminum. Power is applied through a General Electric ½-h.p. Universal type motor, either 110 or 220, AC or DC. An adjustable depth shoe is provided to gauge the cutter contacts, and a steel safety guard protects the operator. The weight is approximately 20 pounds.

Improved U. S. Varidrive Motor

The illustration is a phantom view showing the improvements that have been made in the U. S. Varidrive motor,

DEPENDABLE

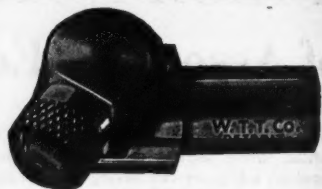


YOU are not gambling with results when you standardize on American Hollow Bored Forgings. Your first supply will set a standard for quality and strength that will be upheld unwaveringly at all times.

Write for quotations on Spindles, Piston Rods, Clutch Shafts, Etc.

AMERICAN

Hollow Boring Co.
2000 Raspberry St.
Erie, Pennsylvania



Real Economy

Every user of diamond dressing tools should investigate the TRUCO Wheel Dresser. In addition to its economy, it is highly efficient, unusually flexible, strongly built and long in life.

\$5.00
and up

WHEEL TRUEING TOOL CO., INC.
13931 Oakland Ave. Detroit, Mich.

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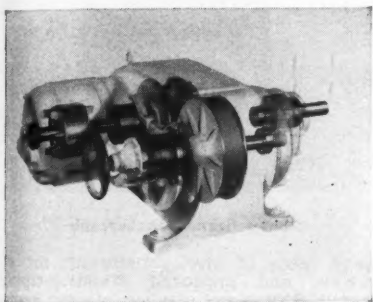
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made by the U. S. Electrical Manufacturing Co., 1571 South Western Ave., Chicago, Ill. The units which formerly were separated, consisting of a constant speed motor, a variable speed device, and a gear case, have been built into one compact unit at a great saving in space in addition to the economy effected as a result of the elimination of mounting bases and transmissions (such as couplings, fans, and belts) between the component parts. The new lever arm construction which has been developed for the larger horsepower ratings is also visible.

Speed change is obtained through



Improved U. S. Varidrive Motor

micro-speed control which varies the effective driving diameter of the Varidiscs. These discs expand and contract for higher and lower speeds, transmitting power through the Varibelt to the take-off shaft. Being self-contained, the motor can conveniently be direct-connected to the driven unit. It places at the operator's command any variation of speed, making it possible to operate the driven unit at its highest capacity at the will of the operator.

Improved "Baby Grand" and Standard Etchographs

The "Baby Grand" Etchograph, made by William Brewster Co., Inc., 50 Church St., New York, N. Y., and announced on page 70 of the August, 1931 issue of MODERN MACHINE SHOP, has been redesigned to provide marked improvements. The "Baby Grand" is intended for use in shops where an electric marking instrument is needed for etching high speed or carbon steel cutting tools, gages, test pieces, and small parts, where three marking heats will be sufficient for the work.



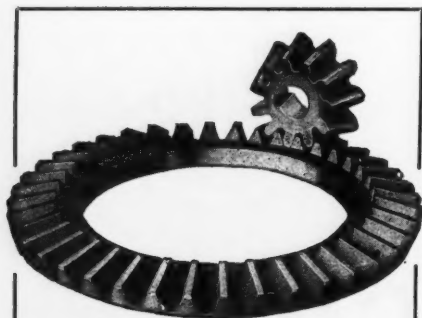
Clipper

**BELT LACING
EQUIPMENT**

The
FIRST STEP
TO ECONOMY
in
Plant
Operation

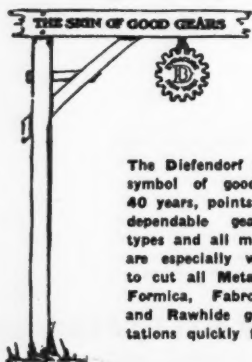
CLIPPER BELT LACER CO.
GRAND RAPIDS, MICHIGAN





DIEFENDORF Big, Straight Bevel GEARS

Gears similar to the above, even up to 50" Diameter, $2\frac{1}{2}$ " Circular Pitch are just examples of our cut to order specialties. Our equipment, service and experience are at your call to quickly and economically meet your requirements.



The Diefendorf sign post, a symbol of good gears for 40 years, points the way to dependable gears of all types and all materials. We are especially well-equipped to cut all Metals, Micarta, Formica, Fabrolite, Celoron and Rawhide gears. Quotations quickly furnished.

**DIEFENDORF GEAR
CORPORATION**

Syracuse, N. Y.

The Standard Etchograph now has seven marking heats and is capable of handling almost any job including such alloys as Stellite and Carboloy. The capacity of the Junior Etchograph has also been increased and the instrument now has five marking heats, making it efficient for use on dies, jigs, gears, and so on.

Other improvements include instru-



"Baby Grand" Etchograph

ment cases of steel, enameled, for all models, and improved Elkonite-tipped pencils with which deeper, clearer markings and longer pencil life are insured. The tips do away with the necessity of cleaning grease or oil from the work to be marked.

Landis Tap Chaser Throat Grinding Attachment

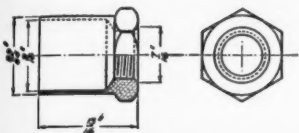
For the customer's use in regrinding the throat or chamfer on Landis Collapsible Tap Chasers, the Landis Machine Co., Waynesboro, Pa., has placed on the market the Tap Chaser Throat Grinding Attachment illustrated herewith.

It is vitally important that the throat on all the chasers in a set be ground to exactly the same degree and length. If this is not done the chasers will not cut uniformly, but part of the set must take the entire burden of cutting the thread.

The base of the Landis Tap Chaser Throat Grinding Attachment is arranged for bolting to the table of most standard makes of tool and cutter grinding machines. Attached to the base is a swivel base which carries the spindle to which is attached the vise base for holding the chasers. The vise base is adjustable for setting the chasers on a radius corresponding with that of the thread which

Brass Rod cut these costs by 44.2%!

NOSE SLEEVE



Production per Day Brass 1,760 ... Steel 480
 Production Ratio 3.66:1
 Cost Reduction with Brass per M pieces ... \$12.64 (44.2%)

	BRASS	STEEL
Pounds stock per M pieces	100	92
Metal cost per pound	\$ 13.65	\$.0405
Metal cost per M pieces (before scrap credit)	\$13.65	\$ 3.726
Pounds scrap per M pieces	80	75.6
Scrap salvage value per M (brass @ \$.05¼ per lb.)	\$ 4.20	
Net metal cost per M pieces	\$ 9.45	\$ 3.73
Machine, tool, labor, and overhead charges per M	\$ 6.52	\$24.86

TOTAL NET COST PER M PIECES \$15.95 \$28.59

\$28.59 total net cost
per M pieces in steel

\$15.95 total net cost
per M pieces in brass

OTHER comparative figures on brass and steel costs for typical screw machine products are given in *complete detail* on pages 10, 11 and 12 of the new, revised edition of Anaconda Publication B-14.

And note this significant introductory paragraph to this particular chapter . . .

"It is generally conceded that small diameter parts are in most instances more economically made of

brass. In the various cost comparisons, examples having relatively large diameters and consequently a higher ratio of metal to production costs have been purposely included. These examples clearly indicate that the use of brass for large size parts often effects substantial savings."

If you make, sell, buy or use screw-machine parts of *any metal*, you'll want this booklet. For your free copy, write today.

THE AMERICAN BRASS COMPANY

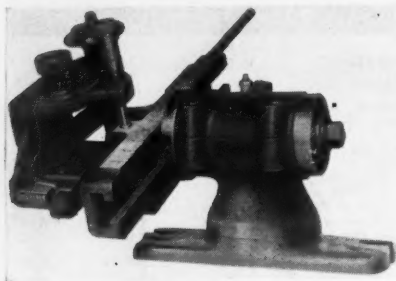
General Offices: Waterbury, Connecticut

Offices and Agencies in Principal Cities



ANACONDA COPPER & BRASS

they are to cut. The vise base is graduated for diameters from 1 to 13½ inches. It is also fitted with a micrometer for obtaining the desired amount



Landis Tap Chaser Throat Grinding Attachment

of radial clearance with which the chasers should be ground.

The vise base is provided with a milled flat which will accommodate all sizes of tap chasers manufactured by the Landis Machine Co. The individual chasers are held by an adjustable clamp and locked with a hand screw. The vise

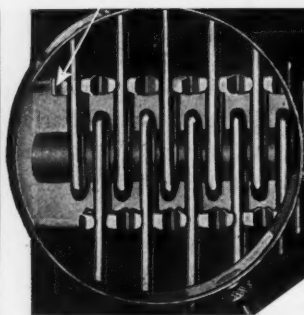
base rotates with the spindle, which is fitted in a capped bearing, to provide an oscillating movement for grinding the chaser against the face of a cup shaped wheel. To facilitate this movement a handle is fitted to the vise base. This motion will produce a radial clearance on the chaser throat.

The attachment is suitable for grinding all sizes of chasers used in Landis Style LT and Style LM Taps as well as chasers used in the Victor Collapsible Taps previously manufactured by the Landis Machine Co. up to and including 12 inches.

Production Type 301 H Buffer

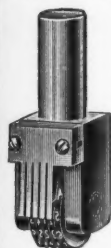
The illustration shows a heavy duty buffing machine now being built by the Production Equipment Company, 5221 Windsor Avenue, Cleveland, Ohio. The buffer is powered by a motor of semi-enclosed ball bearing design, with an extra heavy spindle and bearings that are unusually large and heavy for a machine of this type. The spindle, which is of heat treated alloy steel, is furnished with safety type threads and flanges.

Power is supplied to the machine through a starter of the push button

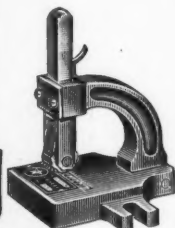


Safety REG. U.S. PAT. OFF. **ASK YOUR JOBBER**
BELT HOOKS
 WITH STEEL BINDER BARS
No Waste STRONGER LAST LONGER
 Write for "ASKS ALL—TELLS ALL" Folder
 Safety Belt-Lacer Co., Factories Bldg., Toledo, Ohio

Mark It Quickly with a NUMBERALL



Made with 1 to 8 wheels.
Stamp in perfect alignment.
Shank for Hand or Press
Stamping. Platform for
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other small articles.



We also make
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Trade Mark
Stamps, etc.

Write for
Circulars and
Prices.

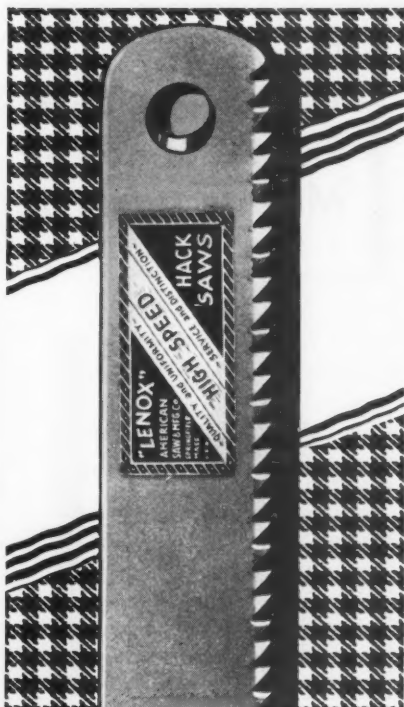
Numberall Stamp & Tool Co.
Huguenot Park, Staten Island, N. Y.

FIBRO FORGED TRADE MARK SCREWS

Did you get your **FREE**
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SOCKET SCREWS?

THE HOLO-KROME SCREW CORP.
BRISTOL, CONN. U. S. A.

Patented By **WRITE DEPT. "H"**
HOLO-KROME



SAVE . . .
ON OPERATING COSTS

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USE . . .

LENOX
HIGH SPEED
HACK SAW BLADES

AMERICAN SAW & MFG. CO.
Springfield, Mass., U. S. A.

Down go Production Costs For Automobile Manufacturers...



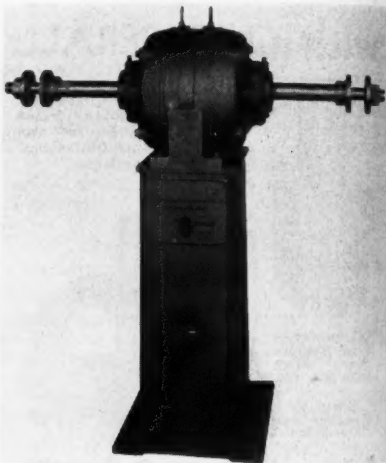
THIS Wicaco Continuous Oil Groover easily turns out 500 parts per hour. Automobile Manufacturers find it a profitable and accurate machine for cutting oil grooves in connecting rods, universal joint retaining rings, distributor shafts and housings, ball joints, babbitt anchor grooves, etc.

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**The
WICACO MACHINE
CORPORATION**

WAYNE JUNCTION, PHILA., PA.

type, with low voltage and overload protection. The machine is built in size according to ratings from $\frac{1}{2}$ to 15-h.p.

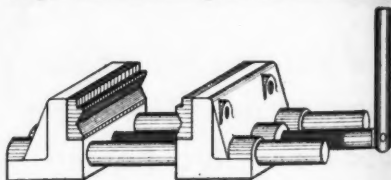


Production Type 301 H Buffer

at both 3600 and 1800 r.p.m. for either 2 or 3 phase—25 or 60 cycle current at 220, 440 or 550 volts.

"Shur-Grip" Drill Vise

A vise for use with drilling machines, designed to reduce setting up time to the minimum, has been placed on the market by Johnson Tool Company, Inc., 67 Massasoit Ave., East Providence, Rhode Island. This vise, called the "Shur-Grip," has built-in parallels for locating

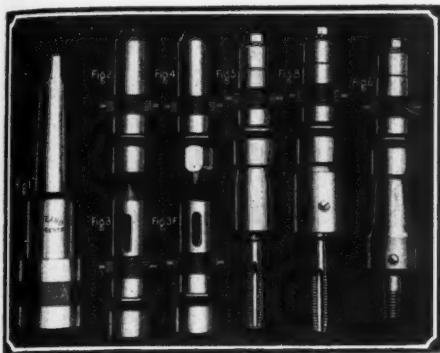


"Shur-Grip" Drill Vise

flat, square, or rectangular work pieces and the jaws contain two V-grooves for holding round work up to 2 inches diameter. One of these grooves is lengthwise of the jaws and the other is crosswise. The handle is swivelled on the screw so that no time will be lost looking for the vise handle.

The jaws, which are of hardened steel,

WIZARD Quick-Change Chucks and Collets



Keep your drill press spindle producing by eliminating time-out for changing tools . . . Hold tools rigid and centered, an exclusive WIZARD feature . . . Can be used horizontally in lathe tail-stock or turret as well as vertically in drill press spindle . . . Offer collet for every type of tool you use . . . Bulletin 14-B gives full details required to select outfit for your particular job. Send for your copy.

1—WIZARD Chuck. 2—Blank Collet to be fitted by user. 3—Collet for taper shank tools. 4—Floating Collet. 5—Collet for straight shank tools. 5 & 8—Friction Drive Tapping Collets. 6—Friction Drive Stud Setting Collets.

McCrosky Tool Corporation
MEADVILLE, PA.

Sales Offices: Chicago, Cleveland, Detroit, Philadelphia, Syracuse.



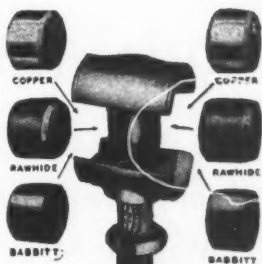
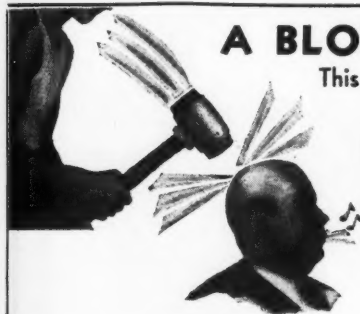
A BLOW WITHOUT A DENT

This is possible with the

**BASA
HAMMER**

with
Removable
Faces

Made in Five
Different Sizes



Rawhide, Copper and Babbitt Faces can be inserted in head by simply loosening nut.

Faces Cannot Rattle in Head, or Fall Out

The clamping jaws of the "BASA" Hammer can be set up to take care of shrinkage or wear of the Faces..

Send for full particulars.

GREENE, TWEED & CO.

Sole Manufacturers

109 Daene St.,

New York, N. Y.

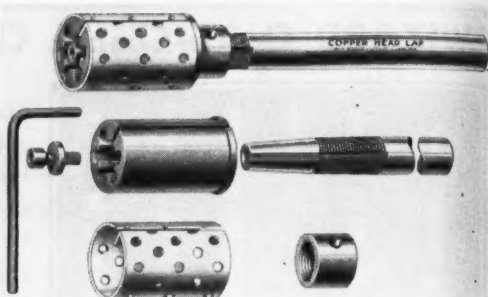
A Hammer that will strike blows of varying hardness without marring the surface.

The Rawhide, Copper and Babbitt Faces make it possible to adapt this Hammer to any class of work.

are 5 inches wide and open 5 inches. The screw is extra heavy for long wear. Total weight of the vise is 15 pounds.

Groetchen Copper Head Lap

To provide industry with a highly efficient lapping tool for the finishing of holes in tool making and other fine work, the Groetchen Tool & Mfg. Co., 124 North Union St., Chicago, Ill., has brought out the lap shown in the illustration. The lap consists primarily of a steel shank, a die cast lap body with a taper hole which fits a corresponding taper on the shank, and a copper sleeve. The shank is held in the lap body by a hardened set screw which holds the shank in the body and is used to expand the lap when desired. The lap can be expanded from a size 0.010 inch below the standard size to 0.010 inch above the standard size. A lock collar provides for maintaining the desired size. Wear of the copper sleeve is compensated through additional expansion.

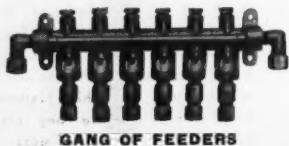


Groetchen Copper Head Lap

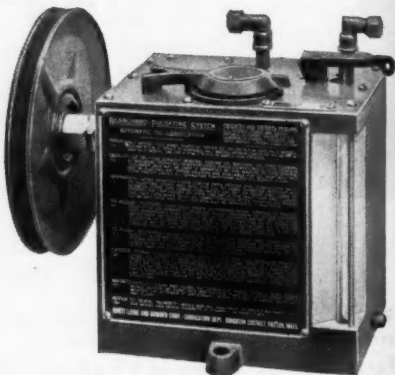
The copper lapping sleeve is perforated with holes which form pockets in which the abrasive nests, thus keeping the lapping surface constantly charged. Abrasive of the Alundum or Carborundum type is used, mixed with a lubricant of the vaseline type and applied to the surface of the sleeve. The entire wear on the tool is taken up by the copper sleeve and, when worn too thin, the sleeve can be quickly removed and a new sleeve substituted.

Blanchard Pulsolator

*Automatic Oil
Lubrication System for
Modern Machinery*



GANG OF FEEDERS

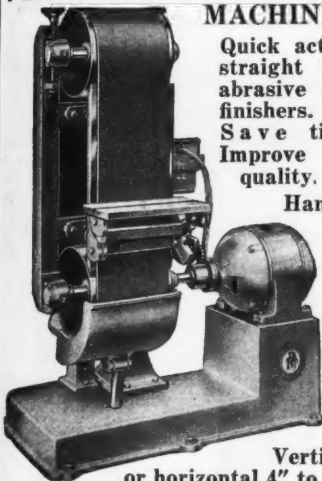


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Modernize your plant and new machines and eliminate bearing failures, high maintenance costs and lost production time with proper application of automatic oil lubrication.

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BRIGHTON, BOSTON, MASS.

PEERLESS SURFACING MACHINES



Quick acting
straight line
abrasive belt
finishers.
Save time.
Improve the
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Handy.

Vertical
or horizontal 4" to 20"

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

SKILSAW DRILLS



**A REAL
MAN'S TOOL**
HUSKIER
SMOOTHER
FINER

Latest Engineering
Improvements in
Every Detail from
Handle to Chuck

**EXTRA
POWER**

Construction . . . plus Ball Bearing
these are only part of the Skilsaw Drill Story.

Test these husky drills in actual performance against any others you ever used—and they will more than prove their superior performance! Extra powerful motors with windings baked in Bakelite . . . grease sealed ball bearings throughout . . . light, strong die cast alloy bodies . . . genuine Jacobs chucks . . . precision construction and finest materials in every detail.

10 POWERFUL MODELS

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Columbia TOOL STEEL

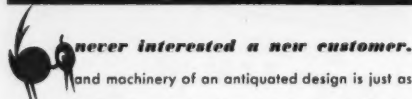
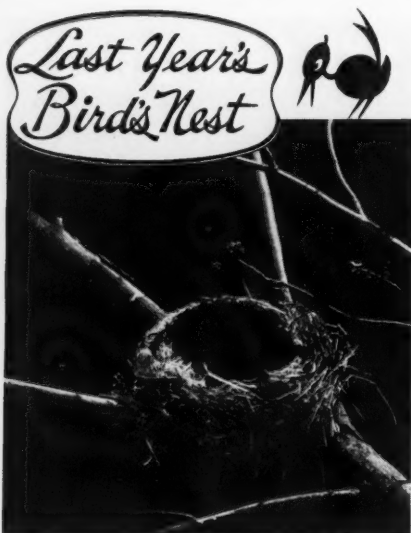
Our greatest
interest in our
fine tool steels
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*It pays to use
Good Tool Steel.*

COLUMBIA TOOL STEEL COMPANY

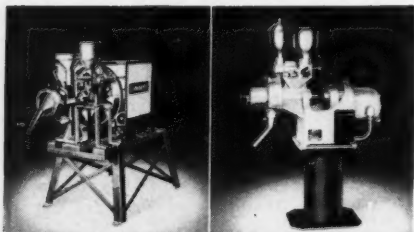
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never interested a new customer.

and machinery of an antiquated design is just as lacking in appeal. New design that is fundamentally sound inherently adds new features... new uses... lowered costs... real sales advantages. Your design problems will be greatly reduced by the use of Master Guaranteed Motors, in either Geared Head or Standardized types. Master Engineers welcome every opportunity to assist in the selection of the motor best suited to your particular requirements.



THE MASTER ELECTRIC COMPANY
DAYTON OHIO U.S.A.

Special copper head laps are available in sizes graduated from 1 inch to 1½ inch by sixteenths of an inch. Three copper lapping sleeves are provided as standard equipment.

Wesson Micro Adjustable Boring Bar

The Wesson Company, 1052 Mt. Elliott Ave., Detroit, Michigan, has placed on the market a new type of boring bar, shown in the illustration herewith. The



Wesson Micro Adjustable Boring Bar

bar is designed for taking boring cuts of single and multiple dimensions and has micromatic adjustment with a range of from ½ inch to 4 inches, depending upon the size of the bar.

The boring tools are adjustable both in and out, and are furnished in either high speed steel or cemented carbide.

Brown & Sharpe Nos. 8S & 10S Micrometer Calipers

The Brown & Sharpe Manufacturing Company, Providence, Rhode Island, announces the inclusion in its line of the micrometer calipers Nos. 8S and 10S, illustrated herewith. The micrometer is said to be of improved design.

The threads of the measuring screw are carefully ground in a one piece hardened spindle of high chromium, high carbon steel, insuring extraordinary resistance to wear. The use of this wear resisting steel in the anvil as well as in

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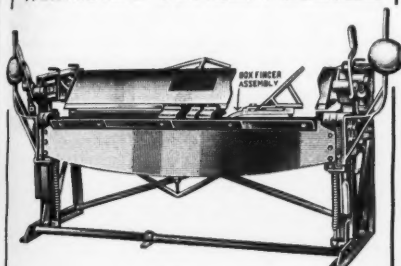
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It is
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SANDING

The Rotor Disc Sander shown above, used with a 9" Sanding Pad, quickly produces a high finish on sheet metal products such as automobile bodies, metal furniture, fixtures, partitions, etc.



THREE SIZES

B-1 10 lbs., B-2 11½ lbs., B-3 12½ lbs.

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The Rotor Air Tool Company

5600 Carnegie Ave., Cleveland, Ohio

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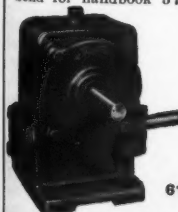


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DEALERS: Write us today about special dealer discount on BOND STOCK Speed Reducers.

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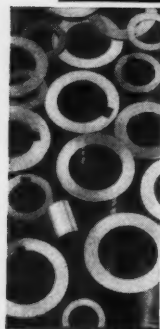
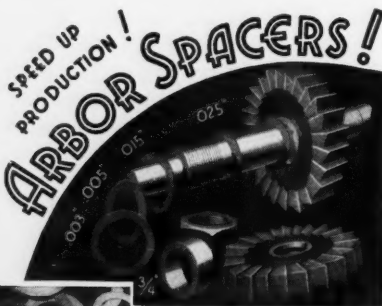
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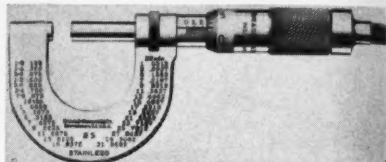


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Identification marks and
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the spindle gives unusually long life to the measuring surface. The frame, thimble, and barrel and all of the unhardened parts are of stainless steel and steel used in the spindle anvil is stain resisting. To aid in the accurate read-



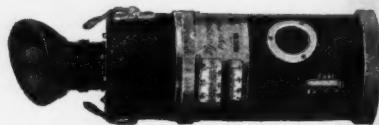
Brown & Sharpe Nos. 8S & 10S Micrometer Calipers

ing of the micrometer, the thimble is graduated with large figures on a non-reflecting background.

The No. 8S is made to measure from 0 to 1 inch by thousandths of an inch and the No. 10S will measure from 0 to 1 inch by ten thousandths. Either tool is furnished with or without ratchet stop.

Pyro Universal Triple Range Optical Pyrometer

The Pyrometer Instrument Co., 101-105 Lafayette Street, New York, N. Y., has placed on the market a Universal Triple Range Optical Pyrometer. This instrument is claimed to be absolutely self-contained, rugged, dust and fool-proof. It has two standard calibrated scale ranges from 1400 to 3400 degrees F. and a third direct reading scale from 2200 to 3700 degrees F., the latter indi-



Pyro Universal Triple Range Optical Pyrometer

cating the true spout and pouring temperature of molten iron and steel when measured in the open. Aside from general plant and foundry use the pyrometer is particularly intended for steel mill uses, open hearths, soaking pits, rolling mills, metallurgical laboratories, and so on. Its unique construction and concentrated testmark permit unusually close and rapid temperature determination even on minute spots, fast moving objects or the smallest streams. There are no correction charts or curves, no accessories, and no maintenance ex-

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\$1.00 will bring you this Automatic Stop . . . the most economical stop for blanking dies. SAVES 75% of your automatic stop cost. Can be fitted to any blanking die in 35 minutes. Conventional design . . . strong . . . simple. Send your order today.

Automatic Stop \$1.00 each

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(Discount 15% on dozen lots)

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1421 N. LINCOLN ST. CHICAGO, ILL.

THERE ARE TOOLS and TOOLS!

By

E. B. GALLAHER

Editor, Clover Business Service
Treasurer, Clover Mfg. Co.

THERE'S A LOT OF DIFFERENCE in Sandpapers and Metal-Working Cloths! After all, Coated Abrasives are nothing but tools; and you know there are good and poor tools of every kind—same thing with Coated Abrasives!

● Now, there is nothing more discouraging than working with poor tools—we've all tried it—but it's strange how many of us take it for granted that all Coated Abrasives are alike! Nothing could be farther from the fact.

● If you have never worked with Clover Color-Stripe Abrasive Papers and Cloths, you have a real treat in store.

● They are so much better—cut so much faster—do so much more work—are so uniformly good, that you will always call for them after having been introduced.

● No! All Coated Abrasives are not alike—there is a whale of a difference in them—though, unfortunately, both good and bad are sold at the same price. Maybe it is for this reason that we have thought there was but one standard of quality?

● Green-Stripe Flint Papers—Red-Stripe Emery Cloth—Yellow-Stripe Aluminous Oxide Papers and Cloths—Orange-Stripe Garnet Papers and Cloths—Blue-Stripe Silicon Carbide Papers and Cloths. All the best of their kind made!

● Will you not try them at our expense? We know you will get a great kick when you use one of these super products.

Gallagher

CLOVER MFG. CO. NORWALK, CONN.

Also makers of the famous

Clover Grinding and Lapping Compounds

pense. A master lamp, aside from two service lamps, is furnished with each instrument for self-recalibration.

The pyro optical pyrometer can also be furnished in single range, double range and special foundry types.

Osgood "Universal" File and Screwdriver Handle

The Osgood "Universal" Handle, made by J. L. Osgood Handle Co., 43 Pearl St., N. Y., and illustrated herewith, is in-



Osgood Universal Combination Balanced-Grip Handle

tended for use either with a file or screwdriver. The handle is designed to fit the hand perfectly and to provide a balanced grip which facilitates the operation of the tool with which the handle is used.

The feature of the handle consists in the longitudinal grooves which, in combination with a circular finger groove,

affords a powerful twisting motion for driving screws. When used with a screwdriver, by placing a finger in the circular groove the pressure can be held forward when the hand is slipped back to give the tool an added twist.

Super-strong construction is provided by the use of a long steel double-flanged ferrule which is forced into the interior of the handle. The handle is made in six sizes; from 4 inches long, for files 2 to 4 inches, to 5½ inches long for files from 14 to 20 inches.

Fauver Trolley Lubricator

To solve the problem involved in the adequate and economical lubrication of the trolley bearings of overhead trolley conveyors, the J. N. Fauver Company, 91 Selden Street, Detroit, Mich., has brought out the trolley lubricator shown in the illustration. The design of the lubricator involves the use of a standard Norgren reducing valve and Norgren air line lubricator. The lubricator is attached to the plant air-line at a point directly over the trolley line so that as each trolley passes over the lubricator it trips a pair of triggers connected to a blow-valve. The pressure in the air-

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SAFETY FRICTION

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ELIMINATE
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Adjustable
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Tap Holder
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PROCUNIER SAFETY CHUCK CO.

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• SIMPLE
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Brown & Sharpe No. 210 CENTRIFUGAL MOTORPUMP

SPECIAL MATERIALS used
throughout to resist wear and
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May we send
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BS

CYLINDRICAL SUB - PRESSES

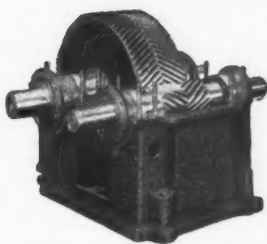
Have several advantages. Alignment is easily obtained and maintained. For circular punches and dies they are particularly economical and for irregular shapes they can be handled as conveniently as other types. Our booklet on Sub Presses and Dies shows when they should be used. Ask for it.



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Waltham Machine Works
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FARREL-SYKES *"The Gear With a Backbone"*



FARREL-SYKES GEAR UNITS

For speed reducing or speed increasing. Any horsepower from 1 to 10,000. Any ratio from 1/1 to 300/1.

Meet all requirements for uniform, silent, positive, efficient transmission of power.

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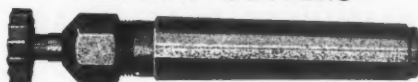
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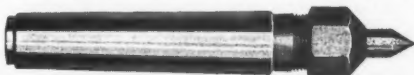
COLLET CHUCKS for End Mills



KEYWAY CUTTERS



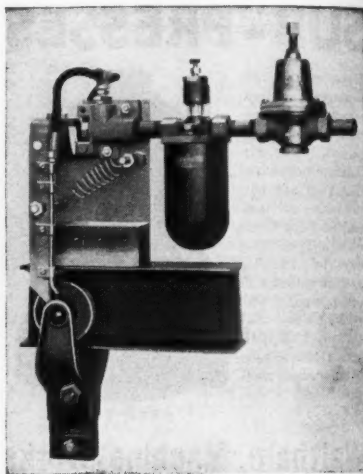
AND NITRIDED CENTER POINTS



line is reduced, where it is connected to the lubricator, by a standard Norgren reducing valve for operating pressure. The air then passes through a Norgren air-line lubricator which introduces into the air stream, a drop at a time, lubricating oil of the proper viscosity. When the triggers are tripped, jets of fogged oil are released and the lubricant is forced directly into the trolley bearings.

The air pressure, oil volume and direction of jet are readily adjustable. The energy required to operate the device is supplied by the moving trolley. Oil storage capacity is 1½ pints. The device

is claimed to reduce the cost of labor and oil, to eliminate dripping, to eliminate trolley break-downs, and to insure the proper lubrication of the trolley



Fauver Trolley Lubricator

bearings, especially in places where the heat from enamel ovens or spray from washing machines or other causes effect the lubrication.

Johnson Lead Hammer Mould

Users of soft lead hammers can make their own hammers by the use of the Johnson Field Mould and Ladle, shown in use in the illustration. The handle to which the head of the hammer is to be affixed is used to manipulate the ladle and mould, no other tools being necessary.

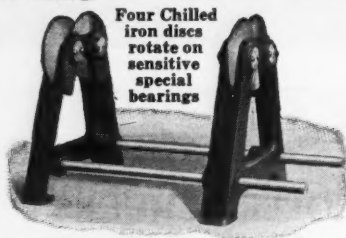
To use, the handle, which is usually a section of iron pipe, is clamped in

Anderson Improved Balancing Ways No Leveling Required

A simple and excellent device for balancing straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



Four Chilled iron discs rotate on sensitive special bearings

Write for Full Information.

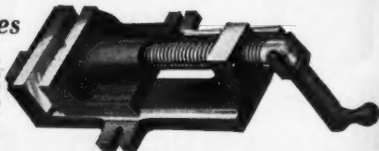
Mfg. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee St., Rockford, Ill.

ELIMINATE SPECIAL AND COSTLY JIG FIXTURES

By Using Yost Drill Press Vises

They are heavily constructed and very compact. Three flanges on the base permit easy attachment to machine or drill press table. A "V" shaped slot milled in the movable jaw permits a positive locking of vertical work. The ease and simplicity in operating makes this tool an indispensable factor in the execution of drill press operations.

Write us for circular "H", giving us name of your nearest dealer.



YOST MANUFACTURING COMPANY, MEADVILLE, PA.

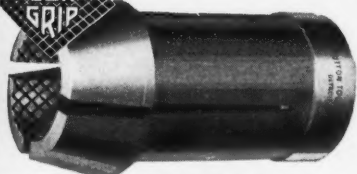
Diamonds In Your Plant

You can find in your plant many applications of diamond serrations to increase friction—on vise jaws, drill chucks, tool handles, etc. But if you wish to use the superior gripping power of diamonds on your screw machines, there is only one collet that can give it, **SUTTON SUR-GRIP**. It is diamond serrated. It grips tighter with less pressure and prevents slippage.

Sutton Sur-Grip Collets



Nothing Grips Like a Diamond



Catalog No. 11 lists **SUR-GRIP** Collets for all makes of machines. Also shows full Sutton line of screw machine accessories: collets, fingers, pads, masters, etc. Send for a copy.

SUTTON TOOL COMPANY

2840 W. Grand Blvd., Detroit, Mich.

ADJUSTABLE While Running!



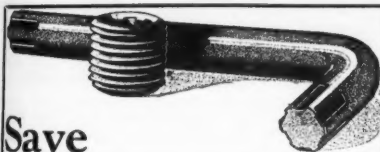
NEW
Absolutely Different

THE PRECISION UNIVERSAL TOOL HEAD

ADJUSTABLE WHILE RUNNING!

What a world of difference between this up-to-the-second, time-saving general purpose tool as compared with old-style offset or eccentric boring tools in which no essential change in the manner of adjustment has been made since the first one was exhibited at the Philadelphia Centennial in 1876—nearly sixty years ago! The Precision Universal Tool Head is a rugged, compact tool, accurately adjustable to fractions of a thousandth or fed continuously by a turn of the wrist **WITHOUT STOPPING** the tool or machine. All diameters from nothing to sixteen inches are instantly available not merely for boring but for facing, recessing, counterboring, undercutting, turning outside diameters, etc.—operations which cannot be performed in Milling Machine, Jig Borer, Horizontal Boring Mill or Radial Drill with any other tool. Send for bulletins showing difficult and unusual jobs done in unbelievably fast time with this truly Universal Tool Head.

THE PRECISION TOOL COMPANY
BRIDGEPORT, CONNECTICUT



Save your men's time and your money

Try Bristo Screws on just one machine and you will see for yourself how they save your men's time in getting a tight positive set. There is no slipping. Nor any jamming, splitting or rounding out.—The Bristol Company, Waterbury, Conn.



WHY THEY'RE BETTER

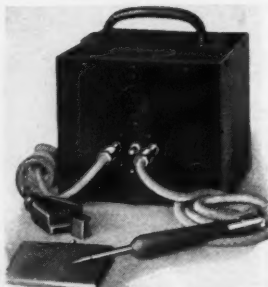
Compare direct turning pressure of Bristos (left) with sidewall pressure of other designs.

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SOCKET HEAD SET AND CAP SCREWS

MARK IRON, STEEL, ETC.with the *Etchograph***NEW
BABY
GRAND
MODEL
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For all small work. Portable. Patented Elkonite tipped pencil for clear, deep marking and long life. Two other convenient sizes. Write for circular and prices.

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"Because of its special design, I can use this Ames bench lathe to make interchangeable parts and for the very finest tool and instrument work.

"Here's what lets me do it, easily . . ."

1. Cast iron bed machined all over
2. Very accurate alignment of headstock and tailstock centers
3. Straight bearings for hardened spindles with adjustments for side play and end thrust
4. Ball-bearing spindle end thrust

Why be content with less when you can have an Ames? Write for the blue catalog with complete facts. Address Department MM, Box 36—Chuck capacity 8/8" or 1" Swing over bed 8 3/8" Maximum distance between centers 21"

B. C. AMES COMPANY
WALTHAM, MASS.

position in the mould, then the lead or babbitt is melted in the ladle by setting it over the flame in the usual manner. When the metal is melted, the tool is tilted backward and the molten metal runs into the mould, forming the head of the hammer. The thumbscrew is then loosened and the hammer is removed

**Johnson Lead Hammer Mould**

from the mould. This operation can be repeated indefinitely.

No skill is required to mould the hammer. Handles of pipe, of suitable length and diameter for the size of hammer desired, and flattened at one end to provide anchorage, can be supplied by the manufacturer of the mould. Wood handles may also be supplied if desired. The manufacturer is Johnson Tool Co., Inc., 67 Massasoit Ave., East Providence, R. I.

Ross "Two Pressure" Operating Valve

Designed upon the principle that the actual pressure required for the idling stroke of a piston in a cylinder is in most cases much less than that required for the work stroke, a "two pressure" operating valve which provides for full-line pressure on the work stroke and selected reduced pressure (easily set or adjusted after the valve is installed) for the return or idling stroke has been perfected by the Ross Operating Valve Company, 6488 Epworth Blvd., Detroit, Michigan.

The difference in the pressure required for the work stroke and the idling stroke is reflected in an appreciable saving on the air consumption. Ross "two pres-

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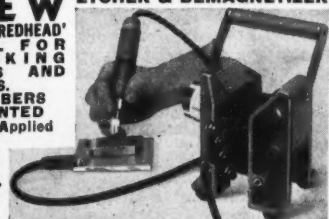
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'REDHEAD'
IDEAL FOR
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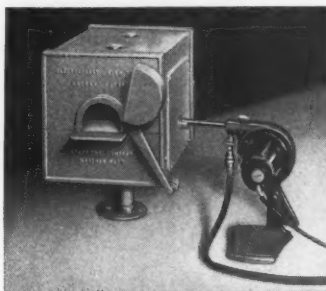
Extremely Accurate and Serviceable. Manufactured under same management for 25 years. Made in 1" to 6" Outside and 1 1/2" to 32" Inside Sizes to read in thousandths or ten thousandths. Also Depth Gauges and Micrometer Sets.

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Powerful torch used separately as a very handy portable flame, \$35. High Speed Muffle Furnace, no scaling or decarburization, reaches high speed heat in 20 minutes at 7c per hour; quickly saves its cost. Muffle 7"x3 1/8"x2 1/8", \$35. Also a large furnace with built-in torch, muffle 7x4 5/8"x3 1/2".

STARK TOOL CO.

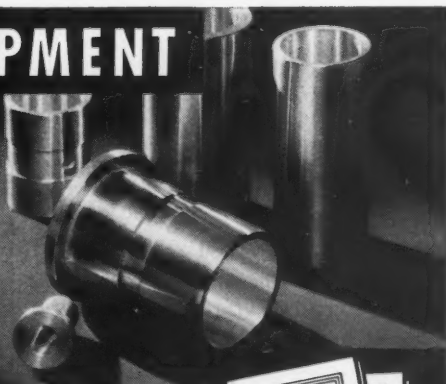
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Waltham, Mass.

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and quality products are the deciding factors—price is the same—that's why hundreds of other large manufacturers order Buckeye quality—from the stock cards. Send for them. Card "G" lists 645 stock sizes of finished bushings—Card "K"—stock sizes of Buckeye electric motor bearings. Send for cards "G" and "K". Then, you too, can get prompt shipment of the exact size you want from stock. No obligation. Write today.

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6412 Hawthorne Ave., Cleveland, Ohio



Buckeye

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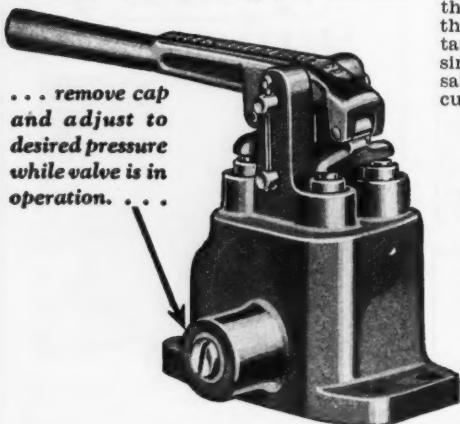
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Free on request. Write today.

sure" operating valves are identical with the standard four-way valves made by this firm with the exception that the



... remove cap and adjust to desired pressure while valve is in operation. ...

Ross "Two Pressure" Operating Valve

mechanism includes a built-in reducing valve which can be regulated from zero to full line pressure for the idling stroke.

The design is such that pressure reduction is accomplished in one supply chamber only, without choking or throttling the exhaust. When mounted, the valves can be set and sealed against tampering until pressure change is desired. The amount of saving made is said to be substantial and easily calculated.

Cleco Air-Line Strainer

The Cleveland Pneumatic Tool Company, 3734 East 78th Street, Cleveland, Ohio, announces a "Line Strainer" which is designed to be placed at individual air outlets to trap scale, grit, and trash out of the lines and to prevent the clogging of air screens and the entry of trash into the working parts of pneumatic tools.

Even where separators are used, the application of these individual air strainers has been found to be highly beneficial, since much scale and dirt has its origin between the separator and the outlet end of the pipe line. The Cleco Line Strainer catches this harmful dirt at the point where it would enter the hose attached to the tool.

Its maker claims that a Cleco Line



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A. S. A. STANDARD

You are sure of getting accurate and dependable drill jig bushings when you order COLONIAL. Made of High Grade Tool Steel. And when you order COLONIAL, you'll get them quickly.

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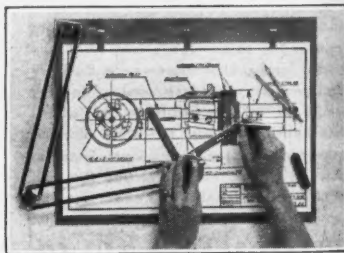
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PORTABLE DRAFTING MACHINES

Complete with horizontal and vertical scales and 180° protractors. Mounted on tempered masonite boards fitted with paper clamps. Machines also furnished without boards.

Built in four sizes to take paper from 9" x 12" to 15" x 20", and priced from \$5.50 up. Detachable scales may be purchased for these units.

The Drafto Co. Cochranton, Pa.

Midwestern Representative: A. J. Moore, 1048 N. Lockwood Ave., Chicago, Ill.



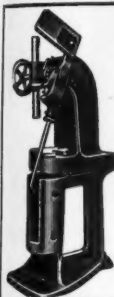
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DIE MAKING MACHINE

With Its Many New Features Will enable you to reduce the cost of labor on your dies, gages, cams, templates, stripper plates, experimental work, etc., from 30% to 60%. Send for our bulletin. No obligation.

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Greenerd Arbor Presses

Write for our Catalog 36 showing 64 different styles



Greenerd Arbor Presses
NASHUA, N. H.



A New Keyseater

With Tilting Table For Either Straight Or Tapered Bores



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Davis Keyseater Co.

Exchange and Glasgow Sts.
Rochester, N. Y.



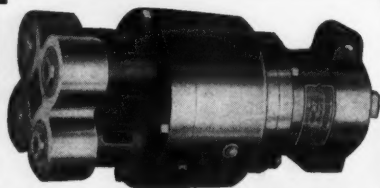
SENSITIVE ECONOMAX

Ideal for fast, accurate drilling. Speed-box on vertical back shaft is equipped with hardened alloy-steel gears and anti-friction bearings running in lubricant. No belt-shifting mechanism. Gear change lever is located directly in front of operator. Six spindle speeds. Capacity from 1/2" to 1 1/2".

Write for Bulletin MS3

THE
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MACHINE TOOL CO.**

CINCINNATI, OHIO



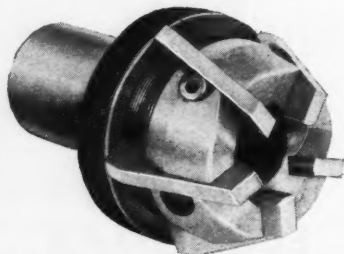
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U. S. Drill Heads quickly convert any single spindle drill into a multiple unit. Heads are standard or special design, depending on your job.

We make recommendations on drilling problems without obligation. Send your blueprints for estimates and recommendations.

The United States Drill Head Co.

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GENESEE ADJUSTABLE HOLLOW MILLS

Are Cutting Costs Everywhere
SEVEN DIFFERENT STYLES

Have Genesee cut your costs. We design and manufacture hundreds of special and multiple operation production tools. Send samples or blueprints now. Write for catalogue.

GENESEE MFG. CO., Inc.
141 No. Water St., Rochester, N. Y.

Strainer, by preventing tool breakdowns and by increasing their efficiency, will save more than its small cost in a few



Cleco Air-Line Strainer

weeks. The strainer is made in three sizes: $\frac{1}{2}$ in., $\frac{3}{4}$ in. and 1 in.

It is illustrated and described in Bulletin "I", which will be mailed upon request.

"Flexrock"

Rough, worn, and broken-out places in concrete floors can easily and quickly be repaired by the use of "Ruggedwear Resurfacer". Ruggedwear is mixed with Portland cement and sand or sand and crushed stone, according to the purpose for which it is intended. The manufacturer claims the ruggedwear resurfacer will band to a feather edge, and it is said to be extremely tough and serviceable. Ruggedwear is manufactured from pure hard mineral, specially processed, and contains no solvents, chemicals, sludge asphalt, or unnecessary foreign matter. It is claimed that the fibre content will not disintegrate and that the surface will remain smooth in service.

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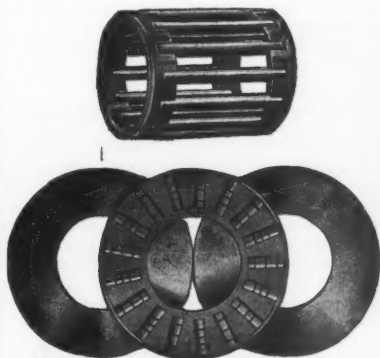
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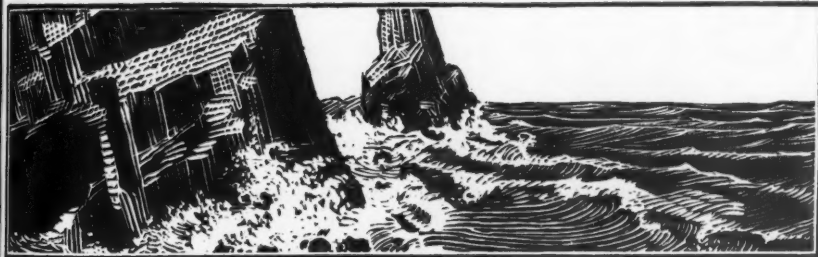
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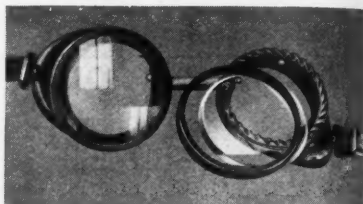
supplied in barrels. A barrel will be shipped with the definite understanding that up to 100 pounds may be used for tests at no cost if it does not prove satisfactory.

"American" AO Duralite-50 Chemical Goggle

A goggle so constructed as to be effectively ventilated but also to provide protection from splashes of dangerous liquids and the impact of flying particles has been announced by the American Optical Company, Southbridge, Mas-

sachusetts. The new goggle is identified as the Type AO Duralite-50 Chemical Goggle. The eyecups are molded to fit smoothly to the contour of the face and so prevent liquid from entering around the goggle. Air circulates through slots in the lens rings, through the radial slots in the eyecups and through the perforated side shields. A solid baffle plate in back of the side shield is flared out on the edge nearest the lens, permitting air circulation but protecting the eye from splashes.

The goggle is fitted with Super Armor-

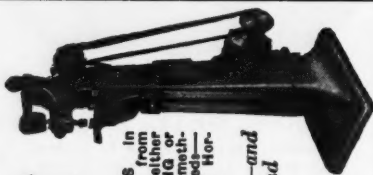



"American" AO Duralite-50 Chemical Goggle

plate lenses, case hardened, providing maximum lens protection from impact. The adjustable rubber-covered ball chain bridge, together with the adjustable one piece head band provides for exact and comfortable setting to the individual worker. It is stated that the goggle can be worn all day long in comfort and without fogging of the lenses; thus the workman is not tempted to remove his goggles and so expose his eyes to possible dangers. Ventilation keeps the eyes cool and the lenses clear, even under humid working conditions.

Euclid Spiral Gear Drive Electric Hoist

An electric hoist designed to incorporate a spiral gear drive has been announced by Euclid-Armington Corpora-






RIVETERS—PIONEERS in their line—Head rivets from their tool—No other by **NOISELESS SPINNING VIBRATING HAMMER** method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

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Importers of Diamonds

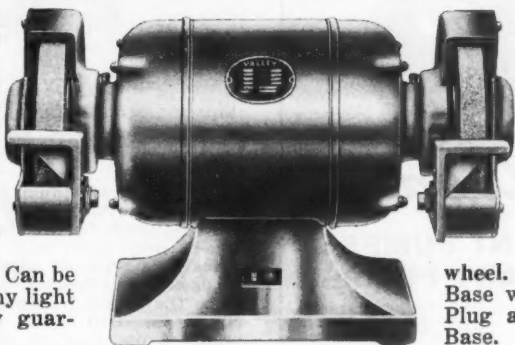
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tion, Euclid, Ohio. The spiral gears provide a drive that is more efficient, quieter, stronger, and smoother in operation. Two teeth are always engaged, eliminating shock load to the teeth.

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All gears and shafts are of alloy steel, heat treated and ground, and all shafts rotate on heavy duty ball bearings, providing the highest efficiency. All gears

are totally enclosed, dust proof, and run in oil. The bearings are splash lubricated and shafts are equipped with oil retainers.

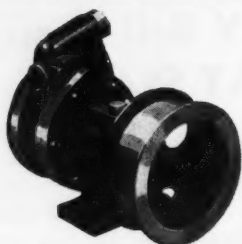
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Euclid Spiral Gear Drive Electric Hoist

gaged. No adjustment is required and the manufacturer states that the brake will hold perfectly until the friction discs are entirely worn out, when they can quickly be replaced at nominal expense. A powerful cam-controlled disc brake stops the motor instantly and positively eliminates drifting of the load. This brake is operated by a cam from the controller on rope controlled jobs or by a solenoid or push button on remote control installations.

The cable drum is of sturdy design and is heavily ribbed to withstand crushing strain. It will take the entire cable in machined grooves without over-

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Steel Bodies —
Lighter, handier,
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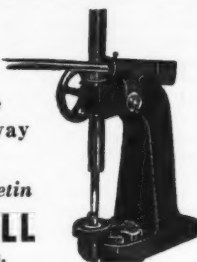
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**Press Your
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Greenfield, Mass.



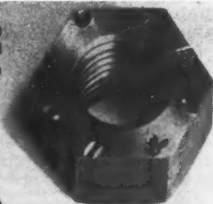
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Foot Press**

Specifications:
Stroke $2\frac{1}{2}$ in.
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Capacity
2" hole thru
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Price \$55.00



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640 Race St. Rockford, Ill.

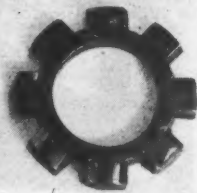
Unretouched photo showing
impressions made by external
type Everlock Washer when
nut is set down.



Unretouched photo show-
ing scores made by teeth
as nut was unscrewed.



Unretouched photo of Ever-
lock Washer that made
above impressions and scor-
ing. The Washer is unharmed
—It is capable of repeating
this operation many times.



Everlock Super Locking is readily apparent!

The above illustrations show why a nut set down on an Everlock Washer cannot be loosened by vibration. The Die-Formed Teeth bite into both the nut and the work—only by tearing part of the nut away can it be released.

Don't confuse Everlocks with any other lock washers you have ever seen. A brief examination will convince you the design is totally different and better. And Everlocks do not damage threads or interfere with tightening the nut.

You can check all these Everlock Super Locking features in your own shop in a few minutes—Free samples for testing are yours for the asking. Just mail the coupon.

SAMPLES FREE Mail this coupon

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Certainly we want to test Everlock Washers. Mail free samples of sizes listed below:

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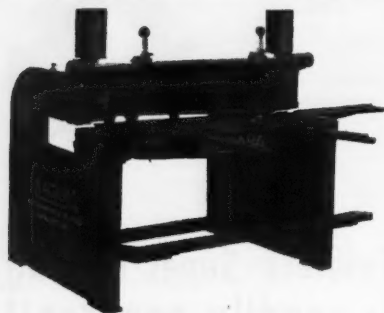
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lapping. Guards prevent jamming of the cable between the drum and frame.

A high torque motor, end-mounted, is used, provided with a self-centering machined bell and a splined coupling. All gears and interior shafts are accessible by removing one plate. The drive pinion gear is splined to its shaft and the cable drum is splined to the drum shaft. All parts are interchangeable.

Niagara Foot Gap Shears

Niagara Machine and Tool Works, Buffalo, N. Y., has announced a line of squaring shears designed with a gap in the housing and for foot operation. The



Niagara Foot Gap Shears

gap permits cutting sheets longer than the cutting length of the shear. The shear is intended to meet the demand for shearing equipment where power drive is not available or where portability is desired. The machine can easily be moved to the job.

The shear is available in five lengths, for cutting sheet metal up to 16 gauge thickness. The housing is one-piece, closed-panel, semi-steel casting, scientifically designed to provide rigidity and

to maintain alignment of working parts and accuracy of knife travel. The steel holddown is operated by eccentrics manually controlled so that heavy pressure may be exerted on the metal to be cut. The cutting edge is visible for locking sheets or for shearing to a line. The eccentric is self-locking, thus enabling the operator to let go of the holddown operating mechanism while he operates the treadle.

The cross head is of steel construction, moving in flat ways and maintained in alignment with adjustable gibs. Counterbalancing springs are of large diameter and are so designed as to produce uniform pressure throughout the cutting process. Pressure does not build up as the cut progresses. The treadle mechanism is built with a large tubular cross-member to eliminate twist and to assure equal motion of both ends of the cross heads, regardless of the location of the operator on the treadle. The treadle extends clear across the front of the machine. The back gauge is positive in setting and may easily and quickly be adjusted. Front gage, side gage, bevel gage, and extension slitting gage are standard equipment.

Harris Slushing Oil

A slushing oil for coating machinery and other metal units to prevent rust while in transit or storage has been developed by A. W. Harris Oil Company, Providence, Rhode Island. Users of the oil state that polished steel can be coated with this compound and left to stand indefinitely in all sorts of weather without fear of deterioration.

The oil is very heavy in consistency, of greenish color, and leaves an amber-colored film when applied to metal. A white slushing oil is available, however, for use on small tools and parts that are wrapped before being boxed.

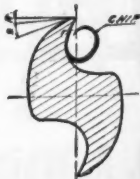
WEL-DON DOUBLE-END MILLS

ENABLE YOU TO USE
HIGHEST SPEEDS... FASTEST FEEDS

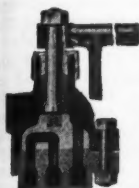
"Double Back-off" shown at right, insures stiffer cutting edge for same clearance angle—you can take heavier feeds without chatter. Flutes are Hollow Ground.



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CAD Standardized set-up appliances

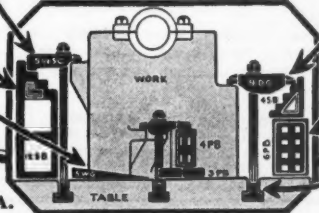
WHY FORCE YOUR MEN TO WASTE TIME on machine-tool set-ups when CAD Standardized Appliances will convert this non-productive time into productive labor? **WHY RUIN MACHINE TABLE-SLOTS** with ordinary bolts when CAD Bolts are designed to fit T-slots? Ask for CAD Folder A-57.

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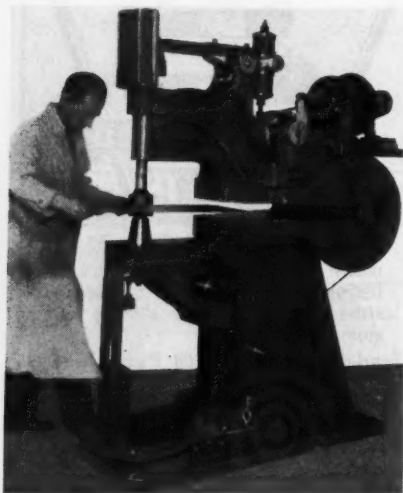
*Set-up appliances for
machine tools.*

8177 TINCUM AVE., PHILA., PA.



"High Speed" Special No. 5½B Flattening Hammer

Trimmed butt welds on sheets of No. 20-gauge steel used in the manufacture of automobile bodies can be flattened at the rate of 70 inches a minute by the



"High Speed" Special No. 5½ B Flattening Hammer

use of a special machine that has been brought out by the High Speed Hammer Company, Inc., 319 Norton St., Rochester, New York. On these sheets, the riser, which has been trimmed, averages about 0.004 inch per side. The hammering operation quickly reduces this thickness to the gauge of the metal, the production time depending on the amount of material left for flattening

after the trimming operation has been performed, also on the gauge of the sheet. The time is also effected by the hardness of the sheet and of the weld.

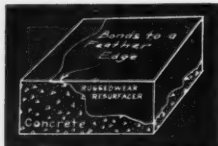
With this method, two flat sheets are butt welded together and the flash is removed by the use of a standard flash trimming machine. The sheet is then given an uniform thickness throughout by hammering with one of the high speed hammering machines. The welded sheets are now stamped and formed without any danger of the weld opening or fracturing. This completed, the sheets are ready for the application of finish without the need of soldering, filling, filing, or other preliminary work.

The hammer is built with a gap to accommodate various widths of sheets. The handling of large welded sheets is facilitated through the use of roller tables or ball transfers constructed on each side of the machine.

Ingersoll Zee Lock Face Milling Cutter

The illustration shows the new Ingersoll Zee Lock Face Milling Cutter which is now being offered to industry by the Ingersoll Milling Machine Company, Rockford, Ill. The Zee Lock Cutter Blade used in this tool is designed to incorporate all desirable features possible. When in position in the cutter it is positively locked; at the same time it is completely adjustable principally in the direction of major wear.

As shown in the illustrations, the Zee Lock Cutter Blade is securely retained in the cutter housing by a Z-shaped wedge. The wedge hooks the front of the cutter body and also the back of the blade, making it impossible for the blade to shift either backward or inward away from the cut. The back hook of the wedge is slanted so that when the cutter blade is reinserted and moved out



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Just What the Name Implies!

Used by every major industry in America for repairing rough, worn, and broken places in concrete floors.


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EXPANDING "TYPE B"



For general factory installations, and all Friction Clutch applications where simple construction, minimum cost and efficient service is considered, the Expanding "Type B" has no equal.

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EXTENDED SLEEVE FOR MOUNTING PULLEYS, GEARS, ETC., ON SLEEVE

Universal Iron Workers PAY for themselves!!

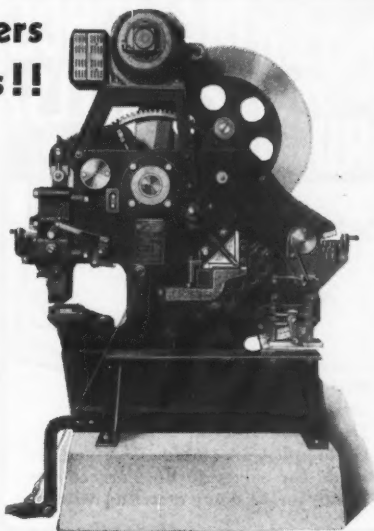
In any shop where angles, tees, beams, channels, flats, plates and special shapes are fabricated, a Buffalo Universal Iron Worker will pay for itself! It cuts production costs to a fraction! It speeds up the work immensely. Three men can work at the machine at one time, for it's really three machines in one.

Punch, Shear, Barcutter

Buffalo Universal Iron Workers are made in several sizes, with complete capacity range for work in shops of all sizes. They are not expensive.

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BUFFALO FORGE COMPANY, 388 Broadway, Buffalo, N. Y.





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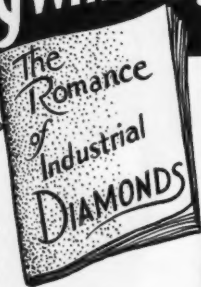
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Detroit,

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for your
GRINDING WHEELS?**

Send for

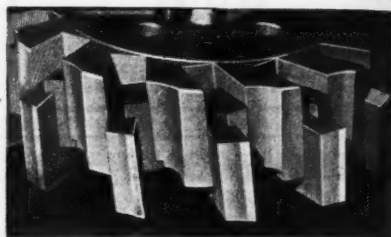


Classifications of History, Characteristics, and Discusses the Diamonds. A table is given as guide for selecting the correct size stones for all your grinding wheels.

ANTON SMIT & COMPANY
SELMA MERCANTILE CORP.
SOLE U.S. REPRESENTATIVES
24 STATE ST., NEW YORK, N. Y.

one serration, it is also moved forward slightly to compensate for the slight amount of face wear. The main adjustment, however, is outward or radial, due to the fact that a cutter always wears in the direction of feed.

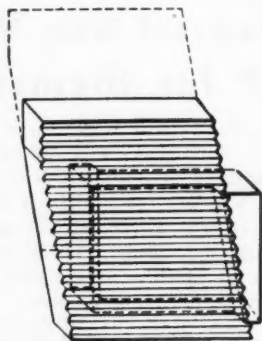
No additional parts are required for resetting. The blade adjusts itself automatically in the proper proportions of



Ingersoll Zee Lock Face Milling Cutter

wear. The wedge is the locking member and is not disturbed by the thrust of cut as this is absorbed by the serrations. The serrations further increase the area of frictional contact for locking.

The Zee Lock Cutter Blade is designed for application to many kinds of cutting tools. For medium duty cutters, the



Drawing Showing Method of Locking Zee Lock Cutter Blade in Housing.

blades are $\frac{3}{8}$ inch thick and are spaced approximately 1 inch apart. The so-called heavy duty cutter using blades $\frac{1}{2}$ inch thick and spaced $1\frac{1}{2}$ to $1\frac{3}{4}$ inches suffices for a general purpose cutter. For the heaviest of milling operations an extra heavy duty cutter with blades $\frac{3}{4}$ inch thick and spaced about 3 inches apart is offered. Cutter bodies are made with the National Standard planer or

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at \$13.9
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accuracy

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EXPANDING MANDRELS**

THEY act like a four jawed chuck, expanding in the bores of collars, bushings, gears, pulleys, etc., and holding them securely while being machined in a lathe, miller, shaper or grinder. For bores from $\frac{1}{4}$ " to 7".

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ARE FAST STARTING—SPEEDY
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including JACOBS $\frac{1}{16}$ " to $\frac{1}{2}$ " chuck. A big, strong drill press—precision-built and production-priced. Many leading manufacturers are using batteries of these Atlas tools in their regular production work.

This Bench Model stands 40 inches high, maximum distance base to chuck jaws, 19 inches. Drills to center of 15-inch circle. Choice of solid or swivel table.

FOUR large, deep-groove SKF bearings—two in the head, two more in the quill—assure permanent accuracy and smooth, quiet operation. Nine speeds, from 600 to 5,200 R.P.M. Special Atlas speed reducer (\$3.95 extra) reduces to 200 R.P.M., gives press ample power to run $\frac{1}{2}$ " drill in steel.

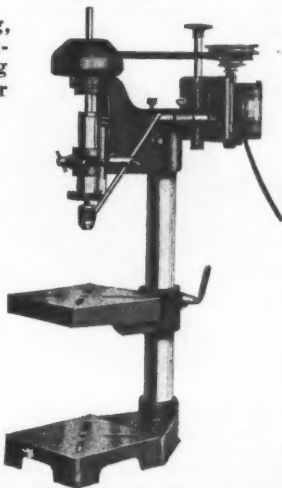
Other ATLAS Drill Presses, both bench and floor models, at \$13.95, \$22.45 and \$33.45. Send for Free Catalog with pictures and full specifications.

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Also Atlas Lathes for smaller jobs—guaranteed to .001" accuracy. From \$39.50 to \$87.50.



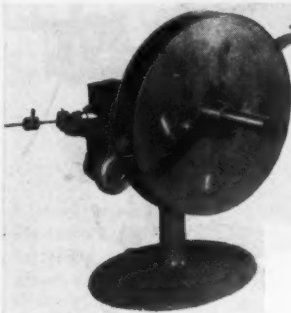
flange nose drive, or to fit any milling machine or horizontal boring mill.

Ingersoll Face Mills are furnished with the Ingersoll Zee Lock Cutter Blade either of special selected forged high speed steel, super-cobalt high speed steel, J Metal Stellite, or tipped with cemented carbide. Cutter housings are of forged and heat treated chrome molybdenum alloy steel.

Littell Roll Feed

The illustration shows a stamping press equipped with a No. 4E single rack and pinion roll feed which is feeding 36 inches with a regular and automatic brake. The roll feed, which has been placed on the market by F. J. Littell Machine Company, 4127 Ravenswood Ave., Chicago, Ill., handles stock up to 16 inches in width and feeds up to 36 inches per stroke of press at a speed of 92 strokes per minute. The stock is fed directly from a power driven roll which unwinds a loop of stock, thus avoiding the necessity of the roll feed pulling the stock directly from the coil due to the fact that it pulls from the loop only.

The press is driven by a U. S. Vari-drive alternating current motor, the speed of which is controlled by the handwheel shown on the front of the press. The speed of the motor is regulated by hydraulic remote control with a range of



Littell
Roll
Feed

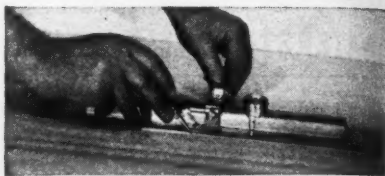
speed from 50 to 150 r.p.m.

The feed is equipped with an automatic roll release which allows the operator to place the stock in the die exactly at the point where it is to be blanked, and the first half feed of the

rolls is "killed" so that the die blanks at exactly the point where the stock is placed without first moving ahead and thus wasting a half blank. This is a very desirable feature in press operation.

Alpha Metro Ruler

The Alpha metro ruler now being placed on the market by the Alpha In-



Alpha Metro Ruler

strument Company, Washington, D. C., is especially designed for use by surveyors, engineers, and

mechanical draftsmen and others who have use for a universal rolling and measuring parallel ruler. It is claimed by the manufacturer that with this ruler spacing and ruling can be done more rapidly and with less eye strain than with any other device. The tool is intended to replace the T-square, scale and dividers on a variety of work.

As shown in the illustration, the ruler is equipped with a rotating horizontal dial, a worm gear and rotating drum. By pressing down on a button the worm gear is locked and the ruler is held

rigidly so that triangles may be applied to the edge. With the worm unlocked, the ruler is moved by rotating a small drum, and the spacings are read on the dial. The drum is graduated on both ends. The drum and dial are readily removable and may be furnished graduated for practically any reading or spacing desired. The ruler is strongly built, of good material, and all parts are replaceable. Spacings may be made rapidly and



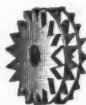
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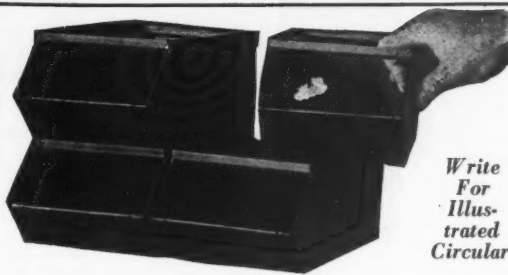
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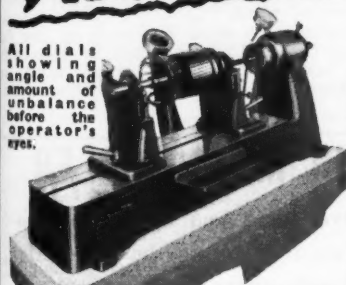
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"D-R" Layout Fluid

laying out metal work. The new fluid is said to have marked advantages over the copper sulphate ordinarily used; providing a dark background against which scribed lines show up with pronounced contrast. The contrast relieves eye strain and aids the mechanic in working accurately and easily to the desired layout.

It is not necessary to polish the surface of the work when using this fluid; the surface is simply wiped fairly clean and the fluid is simply brushed down. It dries instantly.

GENERAL ELECTRIC ARC WELDERS: The Type WD Arc Welding machine made by the General Electric Company,

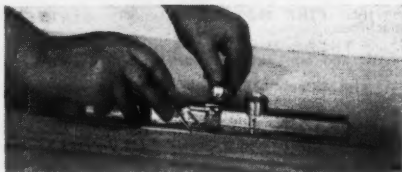
Schenectady, New York, is fully described and illustrated in the bulletin which can be had by addressing department 6A-201 of the above company. The booklet contains some valuable data as to the operation of air welding equipment.

CLIPPER BELT LACERS: The various types and kinds of belt lacings and belt lacing machines made by the Clipper Belt Lacer Company, 980 Front Avenue, N. W., Grand Rapids, Michigan are featured in Catalog No. 22 which is now being issued by the above company. The catalog describes and illustrates lacings and lacing machines for several purposes and conditions. In addition to the description and illustrations of this company's products, the book contains some valuable data as to the strength of lacing required for various types of belts. A copy of this book can be had by any mechanical executive upon request.

HASKINS FLEXIBLE SHAFT EQUIPMENT, TOOLS AND ACCESSORIES: This forty-page 8½ x 11 inch book contains a clear and lucid explanation of the manner in which flexible shaft equipment is being used in modern plants for finishing operations on metal parts of all kinds. The various sizes and types of Haskins flexible shaft machines are described and illustrated together with tools that are used for filing, grinding, burring, sanding, polishing pattern scraping, drilling, and polishing on dies and heavy machinery that can not be processed by any other manner, automobile bodies, and other kinds and classes of work.

Photographs show the tools in use on all of these different kinds of jobs and the text matter tells what kind of equipment is used and what the advan-

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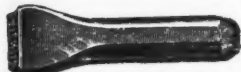


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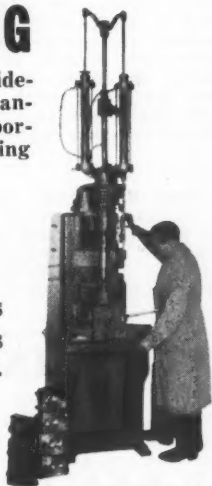
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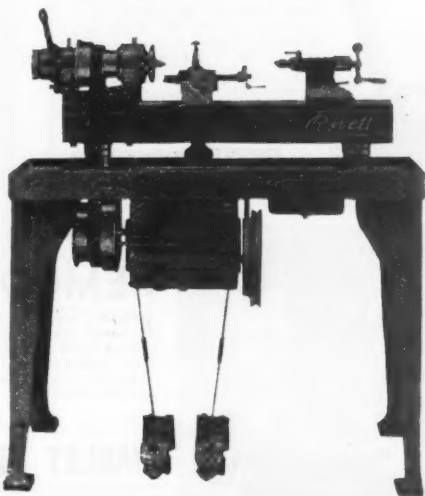
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tages are for the job shown in the individual illustration. In the back of the book is a description, illustrated, of the manner in which the flexible shaft is fabricated, making it possible for the reader to draw comparisons between this shaft and other shafts. Copies of this catalog are available to mechanical executives upon request.

"RED-RATCHET" CATALOG: Many assembling operations could be speeded up with Lowell "Red-Ratchet" wrenches, described in a catalog that is being issued by Lowell Wrench Co., Worcester, Mass. Copy free upon request.

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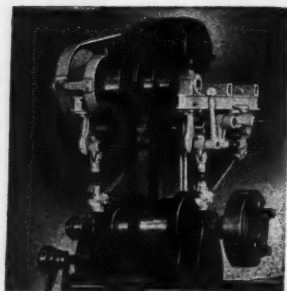
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STARRETT 50TH ANNIVERSARY CATALOG: The L. S. Starrett Company, Athol, Mass., has issued Catalog No. 25, in which are illustrated and described the complete line of machinists' tools, draftsmen's steel T-squares, measuring tapes, micrometers, dial gages, hacksaws and blades, and other tools and instruments made by this firm. The book also contains a number of useful tables for machinists and draftsmen. Copies free to mechanical executives.

LANDIS HAND BOOK, 5TH EDITION: Users and operators of Landis threading and tapping equipment will be interested in the fifth edition of the Landis Hand Book, issued by Landis Machine Co., Inc., Waynesboro, Pa. The book contains 112 pages of information and instructions regarding the manner of grinding Landis chasers, setting of Landis chasers, operation of Landis die heads, cleaning and repairing Landis heads, care and operation of Landis threading machines, operation of Landis collapsible taps, and so on. The book is profusely illustrated with photographs and drawings. A copy of the book will be sent free to any mechanical executive.

BOND GEAR CATALOG No. 57: This catalog, issued by Charles Bond Co., 617 Arch St., Philadelphia, Pa., contains 176 pages of information specially selected to fit the needs of the buyer and user of gears, sprockets, and speed reducers. The book contains descriptions and specifications of practically every kind of gear that might be required, together with prices. Included also are illustrations, specifications, and prices of speed reducers of all types and sizes, sprockets and chains, pulleys, shaft hangers, pillow blocks, ball bearings, couplings, casters, and steel bench legs.

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STARRETT DIAL INDICATORS: Catalog No. 25 MD, issued by The L. S. Starrett Co., Athol, Mass., covers the entire line of dial indicators made by this firm. The book contains 26 pages of pictures and description of the various indicators, emphasizing the design and construction features which make the indicators exceptionally accurate and durable. In addition to the standard indicators, the catalog illustrates many special indicators as applied to bench gages, sheet gages, test indicators, cylinder gages, vibration testers, and similar instruments. Copies free to mechanical executives.

SIMONDS SAW AND FILE CATALOGS: The Simonds Saw and Steel Company, Fitchburg, Mass. and Chicago, Ill., has published a new edition of the Simonds complete catalog made up of five separate sections, each section covering products of special interest to a particular group.

Section No. 035 covers inserted tooth saws, both rip and cut-off, and saw teeth. Section No. 135 illustrates and describes Simonds solid tooth circular saws, narrow band saws, and woodworking ma-

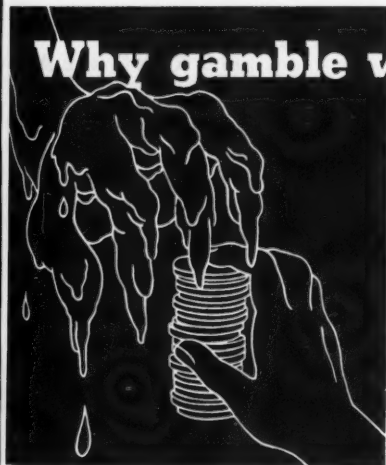
chine knives of all kinds. Section No. 335 covers distributor lines, such as "Crescent" ground cross-cut saws, "Red End" and "Red Streak" hack saws, "Red Tang" files, tool bits, and flat ground stock. The fifth section, No. 435, covers Simonds metal cutting line, including solid and inserted-tooth cold metal cutting saws, metal band saws, tool bits, files and hack saw blades, flat ground stock, rotary shears, and "Tungsweld" metal shears.

Copies free upon request.

DISSTON SAWS, TOOLS, FILES, KNIVES, AND STEEL: This book contains 120 pages of illustrations and descriptions of small tools for both metal and woodworking made by Henry Disston and Sons, Incorporated, Unruh & Milnor Sts., Philadelphia, Pennsylvania. Included also are circular saws for both wood and metal.

Among the metal-working tools are Disston files, hacksaw blades, band and circular metal cutting saws, chisels, hacksaw frames, inserted tooth circular saws, and other tools made by this firm. A copy of the catalog is available to any mechanical executive who will address his request on his firm letterhead.

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BIAX TAPPERS: The outstanding features of design and operation of Biax tappers are presented in a four-page folder that has been issued by The Charles L. Jarvis Company, Gildersleeve, Conn. Copy free upon request.

TOOL SALVAGING: The reclamation of milling cutters, reamers, drills, and other small tools is discussed in a folder that is being issued by National Tool Salvage Co., 3818 Beaubien St., Detroit, Mich. Copy free upon request.

REED MICROMETERS: Machinists and toolmakers will be interested in this catalog, issued by Reed Small Tool Works, 40 Dewey St., Worcester, Mass. The book presents the complete line of micrometers made by this firm and includes a number of useful tables. Copies free upon request.

BOND STOCK SPEED REDUCERS: This 18-page booklet illustrates and describes the line of stock speed reducers made by Charles Bond Company, 617 Arch St., Philadelphia, Pa. These reducers are made in 21 different sizes and in many ratios to each size. The book gives specifications for each type, plan

drawings being used to aid the buyer in selecting the proper type and size for his job. Copy free to any mechanical executive.

WILMINGTON FIBRE PRODUCTS: Engineers or executives who are concerned or interested in the uses of fibre products will be interested in this thirty-two-page catalog, issued by Wilmington Fibre Specialty Company, Wilmington, Delaware. The book opens with a chapter discussing the nature of fibre, telling how it is made and giving the physical properties of the fibre made by this firm. A chapter is devoted to the workability of Wilmington fibre, discussing the behavior of Wilmington fibre under various conditions of heat, moisture, etc. Suggestions for general machining are included with data on milling, drilling, turning, tapping, bending and forming and other operations.

Illustrations show a wide variety of parts made from Wilmington fibre and tables are included giving NEMA standards and specifications, weights of Wilmington fibre, and comparisons of Wilmington fibre with other basic materials. A copy of the catalog is available to any mechanical executive upon request.

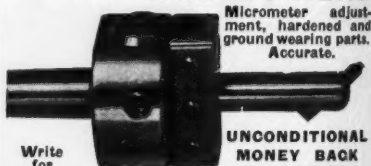
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DISSTON CATALOG OF INDUSTRIAL AND MILL GOODS: This new catalog, issued by Henry Disston & Sons, Inc., Unrich & Milnar St., Philadelphia, Pa., consists of a ring binder with a stiff board cover, in which are bound a series of leaflets describing this company's products. Some of the leaflets contain but four pages; some contain as many as thirty-two pages.

WEL-DON CUTTING TOOLS AND HOLDERS: In catalog No. 7, the Weldon Tool Company, 321 Frankfort Avenue, Cleveland, Ohio, presents the complete line of Wel-don single and double-end end mills with both right and left hand spiral flutes, heavy duty shell and mills, holders, and complete sets of jig boring tools made by this company. A copy of the catalog will be sent to any mechanical executive upon request.

TOBIN BRONZE, GENERAL PROPERTIES AND APPLICATIONS: This 20-page book is devoted to a discussion of Tobin Bronze, which is manufactured by the American Brass Company, Waterbury, Connecticut. The text comprises a discussion of the specifications of Tobin Bronze, forms, physical properties, reaction to corrosion tests, directions for welding and working Tobin Bronze, and other valuable information. A chapter is devoted to Tobin Bronze welding rods, tables are given showing results of tests on standard Tobin Bronze rods, shapes and plates. Copy free upon request.

A TABLOID EDUCATION IN INDUSTRIAL POWER TRANSMISSIONS: This book comprises a practical analysis of some fundamentals of industrial power transmission as outlined by the Power Transmission Council, 370 Lexington Avenue, New York. The council is sponsored by Mechanical Power Engineer Associates, and the information contained in this book comprises, in effect, the best information available on the subject of industrial power transmission, condensed and reduced to its simplest terms.

Each left hand page carries a question that is pertinent to the subject of power transmission, and below the question is a diagram illustrating the question. The right hand page gives the answer to the question and whatever discussion is necessary to make the answer clear. The complete set of answers and questions comprises a tabloid education on power transmission in all of its various ramifications.

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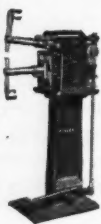
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TAPPING MACHINES: The horizontal and vertical types of friction-driven tapping machines made by Rickert-Shafer Company, 613 West 11th St., Erie, Pa., are described in an illustrated catalog that can be had upon request.

"CP" No. 815 UNIVERSAL ELECTRIC DRILL: This four-page folder, printed in colors, describes and illustrates the "CP" No. 815 drill which has been developed by the Chicago Pneumatic Tool Company, 6 East 44th Street, New York, N. Y. Copies free upon request.

PYRO SURFACE PYROMETER BULLETIN No. 60: This bulletin, now being issued by the Pyrometer Instrument Company, 101-105 Lafayette St., New York, N. Y., describes and illustrates the "Pyro" improved surface pyrometer made by this firm. Pyro surface pyrometers are not only valuable for heat treating operations on metal products, but also for use in sheet mills, plastic molding, rubber, bakelite and electrical plants, paper and textile mills, and other industries. Copy free upon request.

BLACK & DECKER SILVER ANNIVERSARY CATALOG: This catalog, containing 49 pages of $8\frac{1}{2}$ x 11-inch size, illustrates and describes the complete line of electrical portable tools and bench tools made by Black & Decker, Towson, Maryland.

The line includes Black & Decker electric portable and bench drills, portable and bench grinders, portable electric hammers, electric saws, automotive valves, reversing machines and other portable and bench electric tools together with a wide range of attachments for these tools.

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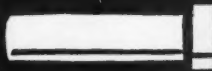
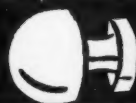
APEX PRODUCTION TOOLS, designed and built to modern standards for speed and accuracy, are displayed and described in Catalog No. 8, now being issued by The Apex Machine & Tool Co., Third and Madison Sts., Dayton, Ohio. Included in the display are Apex Quick Change Drill Chucks, Morse Taper Collets, Free-Floating Tap Collets, Straight Shank Drill Collets, Close-Center Chucks, Vertical Float Tapping Chucks, Safety Friction Tapping Chucks, and many other tools. Copy free.

"GEAR CRAFTSMANSHIP": This booklet, 8½ x 11 inches in size, contains an interesting discussion on "The Technical Craftsmanship of Quality Gears," written by an engineer of recognized standing in the design of production and gears. Every engineer or plant executive who is concerned with the design and production of gears should be interested in this paper. The booklet also contains a panorama of the historical progress of the Meisel Press Company, 944 Dorchester Avenue, Boston, Massachusetts, and gives some interesting observations on the problems involved in the production of quality gears.

A copy of the booklet is available to any mechanical executive upon request.

BATH CATALOG No. 12-B: Due to the valuable information, aside from descriptions of the sponsor's products, that is contained in this nicely printed 68-page book, it will undoubtedly be of value to every plant executive who has anything to do with the selection or purchase of taps. A chapter on "Common Tap Troubles and How To Correct Them" is divided into sections as follows: (1) Faulty or Inadequate Lubrication; (2) Wrong Drill Used; (3) Furnishing Tap Blinding; (4) Dull Taps; (5) Taps Cutting Oversize. Another chapter "Things To Look For In Checking A Tap" contains these divisions: (1) Accuracy; (2) Hardness; (3) Fluting; (4) Pointing; (5) Concentricity; and (6) Quality of Thread Grinding. This chapter discusses the pitch diameter, lead and angle, manner of grinding hook or rakes on flutes, and so on.

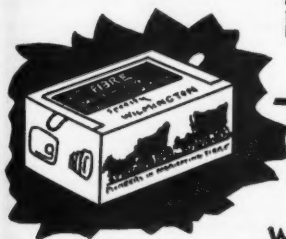
The back of the book contains a number of useful table and reference data regarding taps, screws and gages. The major portion of the book consists of descriptions and specifications of the wide line of taps, thread gages, thread rolling dies, and super internal micrometers made by John Bath & Company, Inc., Worcester, Massachusetts. A copy of the book can be had by addressing this firm.



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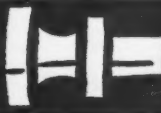
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(These items are listed alphabetically by firm names).

Alpha Metro Ruler, made by the Alpha Instrument Company, Washington, D. C., will help to make better drawings in less time. Send for illustrated circular.

Screw Machine Products manufacturers will be interested in the new "Brass Rod Booklet B-14" now being issued by The American Brass Co., Waterbury, Conn. The text makes a comparison between the machining qualities and production costs of brass and other metals and treats extensively of the design and uses of forming, cut-off, and other tools. Data concerning special cold drawn and extruded shapes in brass, phosphor bronze, and other shapes is included. Copy free upon request.

Cut Your Sawing Costs: "Lenox" hack saw blades and band saws are guaranteed to effect savings on your sawing operations. Write for information to American Saw & Mfg. Co., Springfield, Mass.

Ames Dial Gages: Dial gages, gage heads, cylinder gages, dial thickness gages, dial micrometers and special gages and attachments made by the B. C. Ames Company, Waltham, Mass., are described and illustrated in Catalog 10. Write for copy.

Scrape by Power: Bearing surfaces can be scraped with a power scraper that is quicker and easier than the antique hand method. Write for information to Anderson Bros. Mfg. Co., 1928 Klabwankee St., Rockford, Ill.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by the Apex Machine & Tool Co., 200 Davis Avenue, Dayton, Ohio. Sent free upon request.

Self-Oiling Bearings: Eliminate the lubrication problem by using Arguto oilless bearings, made by Arguto Oilless Bearing Company, Wayne Junction, Philadelphia, Pa. Send for circular.

Unbreakable Hack Saw Blades with bodies of alloy steel and teeth of 18% tungsten high speed steel are described in a circular that can be had by addressing Armstrong-Blum Manfg. Co., 345 N. Francisco Ave., Chicago, Ill.

Economical drilling is the feature of a drill press that is being marketed by Atlas Press Company, 1846 North Pitcher Street, Kalamazoo, Mich. Send for catalog.

Baker Hydraulic Heavy Duty Drilling Machines are described and illustrated in a folder that is being issued by Baker Brothers, Inc., Toledo, Ohio. Copy free upon request.

Arbor Presses in 64 Types and Styles are described and illustrated in a catalog that can be had by writing Edwin E. Bartlett Co., Nashua, N. H.

"Ground-From-The-Solid" Taps: Bath taps are hardened in the solid, then the teeth are generated by grinding, producing absolutely accurate taps. Write for the "Ground Thread Handbook", free. John Bath & Co., Inc., Worcester, Mass.

Bond Gear Catalog No. 57, issued by Charles Bond Company, 617 Arch Street, Philadelphia, Pa., contains 176 pages of information for users of gears, sprockets and speed reducers. Copy free upon request.

Etch your tools and cutters electrically with the "Baby Grand" Etchograph, made by Wm. Brewster Company, Inc., 50 Church Street, New York City. Write for free circular.

Simply assembly operations by using "Bristo" set screws. Ask the Bristol Company, Waterbury, Conn., for samples.

Fine tools of all kinds are described and illustrated in a catalog that is being issued by Brown & Sharpe Mfg. Co., Providence, R. I. Copy free.

645 Stock Sizes of Bronze Bushings are listed with dimensions and prices in the Buckeye Stock List "G". Write for it. Buckeye Brass & Mfg. Co., 6410 Hawthorne Ave., Cleveland, Ohio.

Buffalo Bench Drill: A sturdy, accurate, smooth running drill for fine work is described in a folder that can be had by addressing Buffalo Forge Company, 388 Broadway, Buffalo, N. Y.

Bushings and Bearings: 500 sizes of finished bronze bushings that are available immediately are shown in a catalog that can be had by writing to The Bunting Brass & Bronze Co., Toledo, O.

Cutters for your emery wheel dressers are listed in a circular that is being issued by George H. Calder Company, 650 North Prince Street, Lancaster, Pa. Copy free.

Carboloy Cost-Saving Tools: This booklet, issued by Carboloy Company, Inc., 2485 E. Grand Blvd., Detroit, Michigan, shows a variety of types and designs of Carboloy tools which will increase production and reduce machining costs. Copy free upon request.

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High production, lower milling costs, and a new standard for accuracy are features of the new Cincinnati High Speed Dial Type Milling Machine, described and illustrated in booklet M-588. Write the Cincinnati Milling Machine Company, Cincinnati, Ohio, for free copy.

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The Craley Boring, Turning and Facing Head is just what the toolmaker has long been looking for. Write C. C. Craley Manufacturing Company, Shillington, Pa., for circular and prices.

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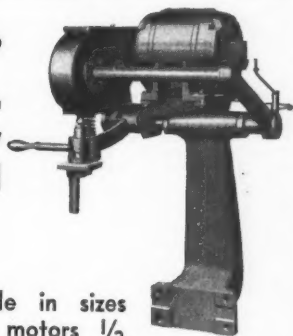
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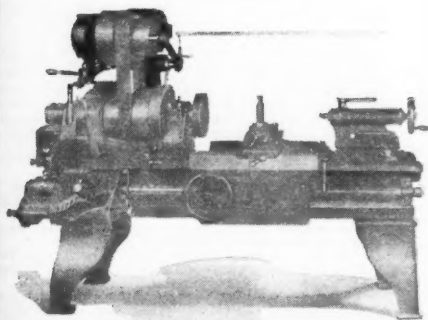
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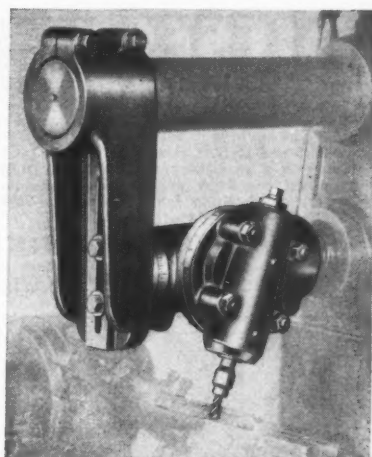
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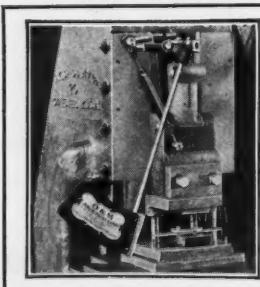
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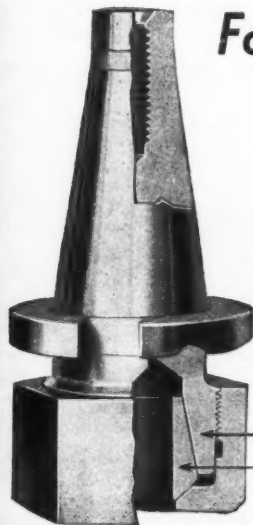
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Reed Micrometers are accurate and serviceable. Discounts and catalog supplied on request. Reed Small Tool Works, 40 Dewey St., Worcester, Mass.

Antimonial lead hammers, burned homogeneously to handle, are economical. Write for prices. Republic Lead Equipment Company, 7930 Jones Road, Cleveland, Ohio.

Bench Lathe Mounting and Driving Equipment: Bulletin 120-A, issued by Rivett Lathe and Grinder Corporation, Brighton, Mass., contains complete descriptions and illustrations of modern and conventional countershafts, individual motor drive jackshaft, and speed box motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

Out Your Air Costs. A leak-proof valve with solenoid control, giving practically instantaneous action, is fully described in a catalog that can be had by addressing Ross Operating Valve Co., 6488 Epworth Blvd., Detroit, Michigan.

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"Hold-Heat" Pyrometers minimize waste, error, and spoilage. Write for circular. Russell Electric Company, 3382 Huron St., Chicago, Ill.

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"The Romance Of Industrial Diamonds" discusses the history, characteristics and classifications of diamonds. Ask for a copy. Address Selma Mercantile Corporation, 24 State St., New York, N. Y.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

Eliminate hand work by using a Skilsaw ball bearing electric hand grinder. Write Skilsaw, Inc., 3310 Elston Ave., Chicago, Ill., for catalog.

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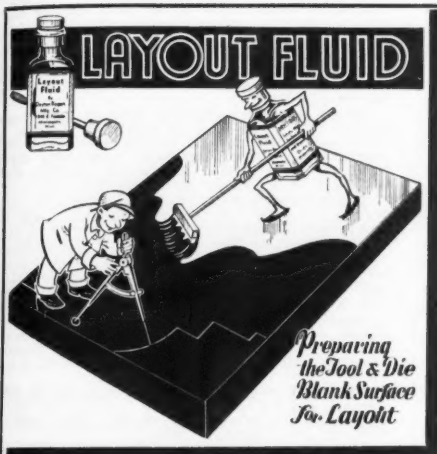
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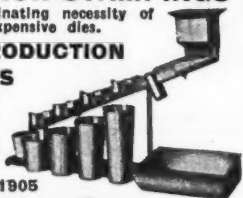
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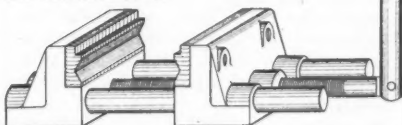
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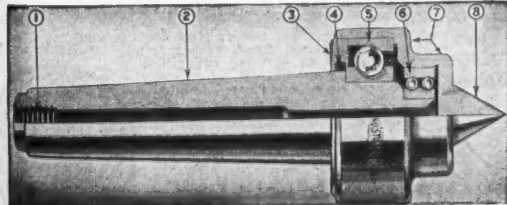
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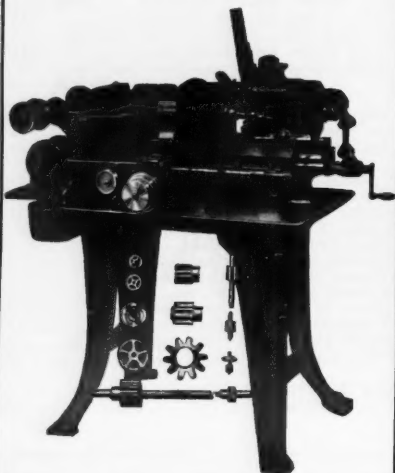
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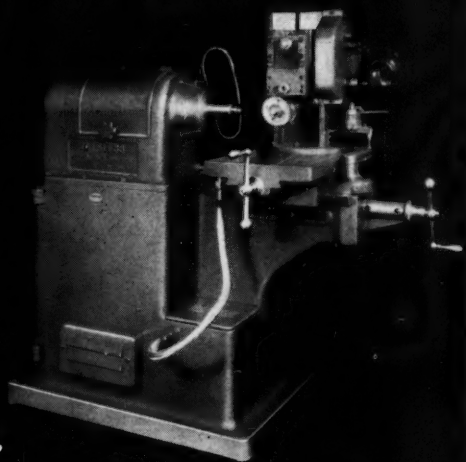
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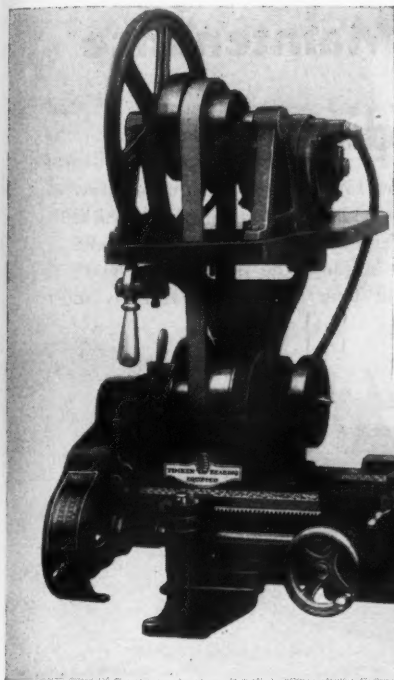
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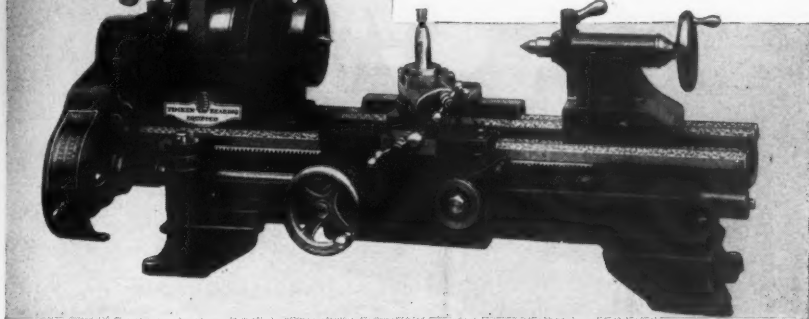
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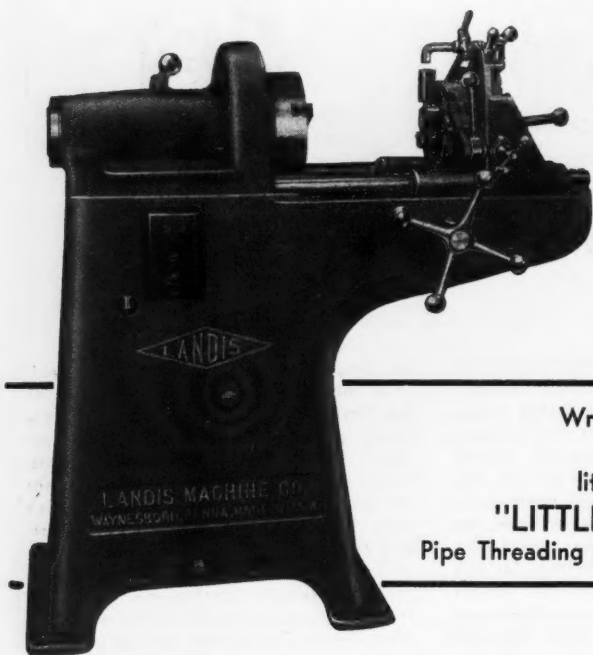
be comparatively easy of accomplishment, while the smooth, chatter-free operation of the Timken-equipped spindle under every speed and cutting load will greatly improve the quality of all kinds of work. From a machine intended primarily for the use of amateur mechanics, the bench lathe has become a thoroughly practical and efficient workshop tool. The adoption of Timken Bearings for the spindle has still further raised its "professional" standing. It will pay you to specify Timken-equipped when buying any type of bench lathe.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN TAPERED ROLLER BEARINGS

Unexcelled for Jobbing and Maintenance Threading

The "LITTLE LANDIS" has no equal for efficient, economical service in threading *pipe* and *bolts* for jobbing or maintenance work. This new LANDIS machine has a built-in gear box to insure efficient operation on all diameters. It employs the patented LANDIS Chaser whose free-cutting action and long life keep tool costs to the minimum.



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Pipe Threading and Cutting Machine

LANDIS MACHINE CO., Inc.
WAYNESBORO, PENNA.

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in a Grinder for Small Drills

SELLERS Grinders—widely known for producing the famous Sellers Drill Point, recommended by leading drill manufacturers—are now offered for drills $\frac{1}{2}$ " and under. Same unique chuck and method of grinding. Same high production capacity. Many modern features. New streamlined compactness. And at a price within reach of every shop. Ask for Bulletin S-5.



1 Insert the drill and a quarter-turn of the hand chucks it securely.



2 Bring the drill up to the wheel.

3 Grind the scientifically correct point. No special skill required.



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The Single Lever
SPEED
Selector



The Single Lever
FEED
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JONES & LAMSON MACHINE COMPANY

THE RAM TYPE UNIVERSAL TURRET LATHE

The advantages of the features shown on opposite page will instantly be apparent to anyone familiar with turret lathe operation.

ONE LEVER IS USED TO CONTROL ALL SPINDLE SPEEDS AND ONE LEVER SELECTS ALL FEEDS

All spindle speeds and all feeds are selected from direct-reading dials without computation from charts . . . Quickly and smoothly the operator shifts from one speed or feed directly to any other . . . The convenience of these features encourages the operator to run the correct feeds and speeds for the cut he is taking.

SPEED RANGES

Any one of these three speed ranges is standard equipment.

20	29	42	60	82	119	169	243	340	489	694	1000
30	45	63	90	123	178	253	364	510	733	1041	1500
40	58	83	120	165	238	338	487	680	979	1388	2000

FEED RANGES

The same feed selector is used for longitudinal and cross feeds.

Longitudinal Feed per rev. of Spindle											
.005	.007	.011	.015	.022	.033	.047	.069	.100			
Cross Slide Feed per rev. of Spindle											
.0025	.0035	.0055	.0075	.011	.0165	.0235	.0345	.050			

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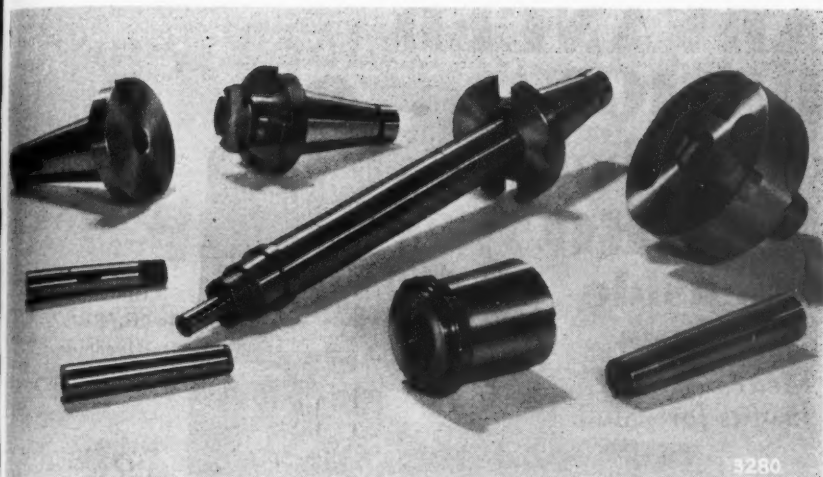
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HAVE YOU CHECKED UP ON YOUR ARBOR EQUIPMENT?

You are primarily interested in obtaining maximum production from your milling machines at the lowest cost consistent with quality. You can increase their productive capacity and ability to produce accurately by the use of Cincinnati Quality Arbor Equipment.



Write for bulletin No. M-559-D describing Cincinnati Quality Arbor Equipment.

Cincinnati Arbors, Collets, and Adapters are of the highest quality . . . made of best materials, built in a special department equipped with modern machine tools . . . and finally subjected to a series of most rigid tests, making certain that the highest standard is always maintained. Cincinnati Arbors have the necessary strength for the toughest milling cut and give you the required accuracy on the finest milling job.

May we suggest you check up on your Arbor Equipment? Write for the illustrated bulletin No. M-559-D.

The CINCINNATI MILLING MACHINE Co.

Cincinnati, Ohio, U. S. A.

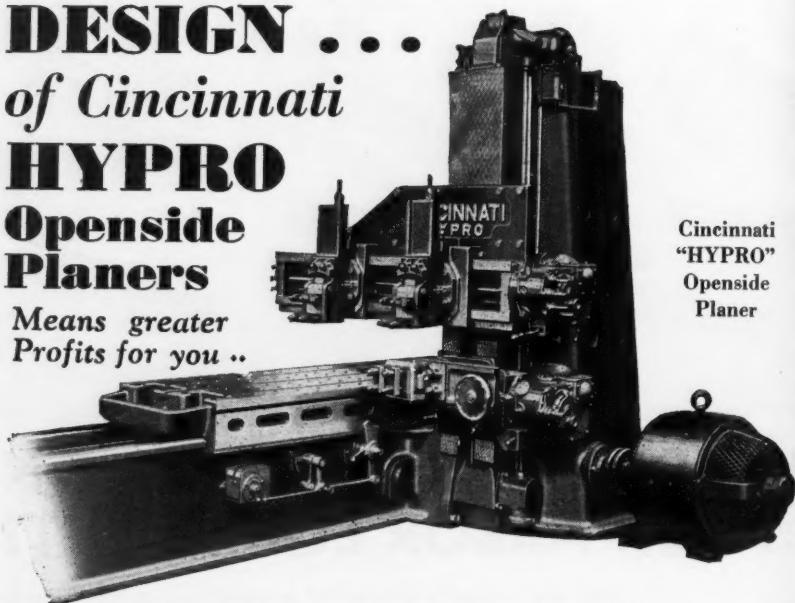
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USERS of the Cincinnati "HYPRO" Openside planers know that these machines may be depended upon to do the rough work as well as the accurate work . . . and do both at a greater profit.

That is why you'll usually find a Cincinnati "HYPRO" Openside planer wherever there is planer work to do.

But, that's not the whole story . . . there are many features of the Cincinnati "HYPRO" Openside planer that you should know about. Cutting speeds and return speeds up to 240 feet per minute.

THE CINCINNATI PLANER COMPANY
CINCINNATI OHIO

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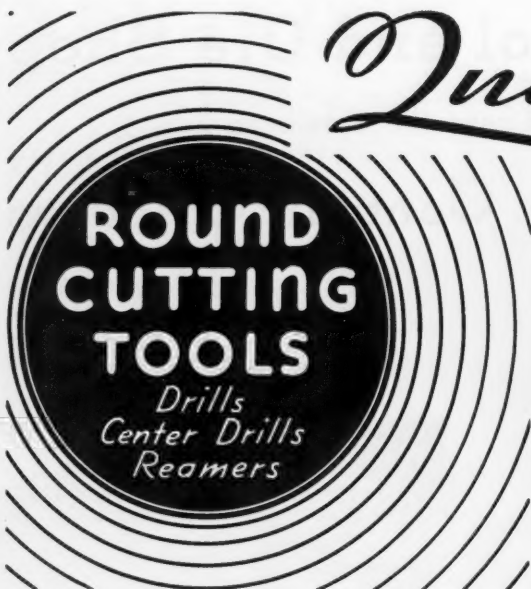
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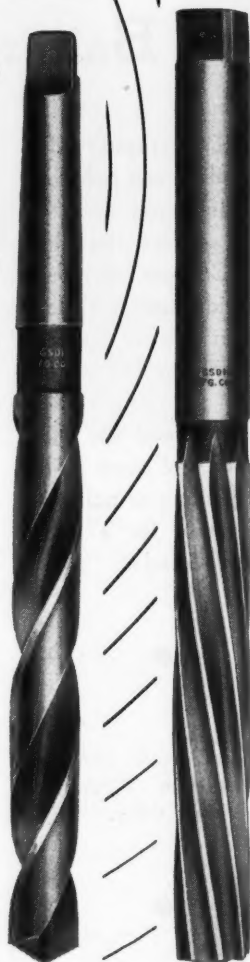
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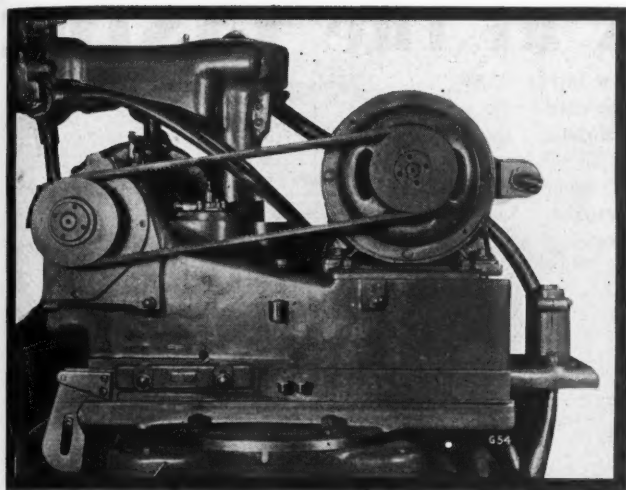
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Not like those ordinarily found on Universal Grinders. Much heavier. Better proportioned. More efficient power delivery to the grinding wheel. Force feed wheel spindle lubrication. Wide ways, well spaced. Automatic hydraulic wheel feed.

That's the Landis Type C 14" Hydraulic Universal wheel base. It not only has these Plain production grinder features but also a swivel and slide making it fully universal.

From end to end these machines are just as sturdy and modern as the wheel base. The result is they are capable of grinding a wide variety of work within a close degree of accuracy and at a speed not associated with Universal machines.

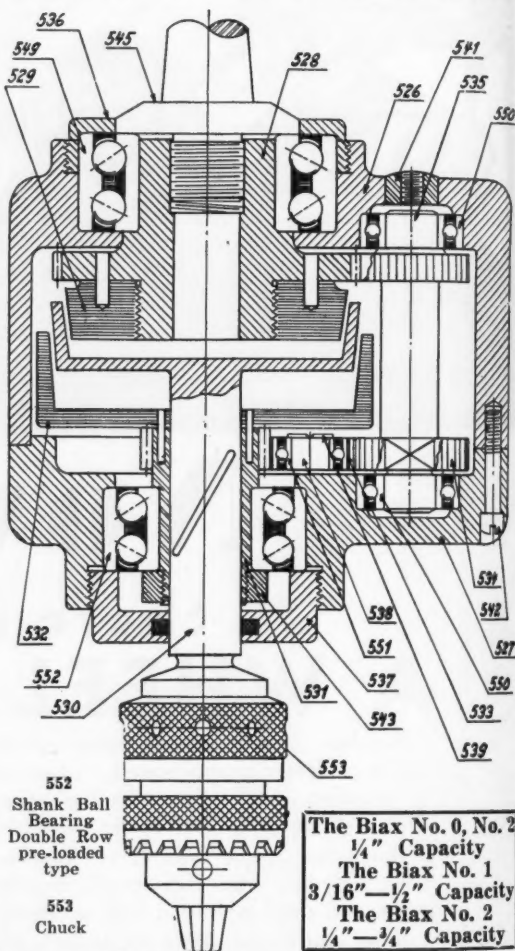
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LANDIS TOOL CO.
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LOOK at the INSIDE

High speed, sensitive tapping attachments, forward and reverse friction, double reverse speed, have to be well designed and most carefully manufactured. Below is a line drawing of the latest Jarvis Biax Tappers.

526	537
Upper Body	Shank Bearing Seal
527	538
Lower Body	Idler Gear Pin
528	539
Upper Steel	Idler Gear Lock Screw
529	541
Drive Friction	Oil Cups
530	542
Chuck Shank	Body Screws (4)
531	543
Reverse Gear	Lock Nut
532	545
Reverse Friction	Morse Taper Shank
533	549
Idler Gear	Main Ball Bearing Double Row pre-loaded type
534	550
Lower Pinion Gear	Pinion Ball Bearings
535	551
Upper Pinion Gear	Idler Gear Ball Bearing
536	
Main Bearing Seal	



The Biax No. 0, No. 2
 $\frac{1}{4}$ " Capacity
 The Biax No. 1
 $\frac{3}{16}$ "— $\frac{1}{2}$ " Capacity
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Trust Your Tapping Operations To These Exclusive Jarvis Features

High Speed—As fast as your tap and material will allow. **Bearings**—Ball bearing throughout. **Clutches**—Textolite, self-adjusting, friction, not affected by grease or heat. **Reverse**—Double tapping speed with larger friction. **Gears**—Chrome Nickle, hardened and ground. **Housing**—Cast Aluminum designed for clear vision. **Chuck**—New Jacobs Double Grip, holding square as well as shank on types No. 0 and No. 1. Jarvis Double Grip Tap Chuck on No. 2.

Write us. We have a tapper for your requirements.

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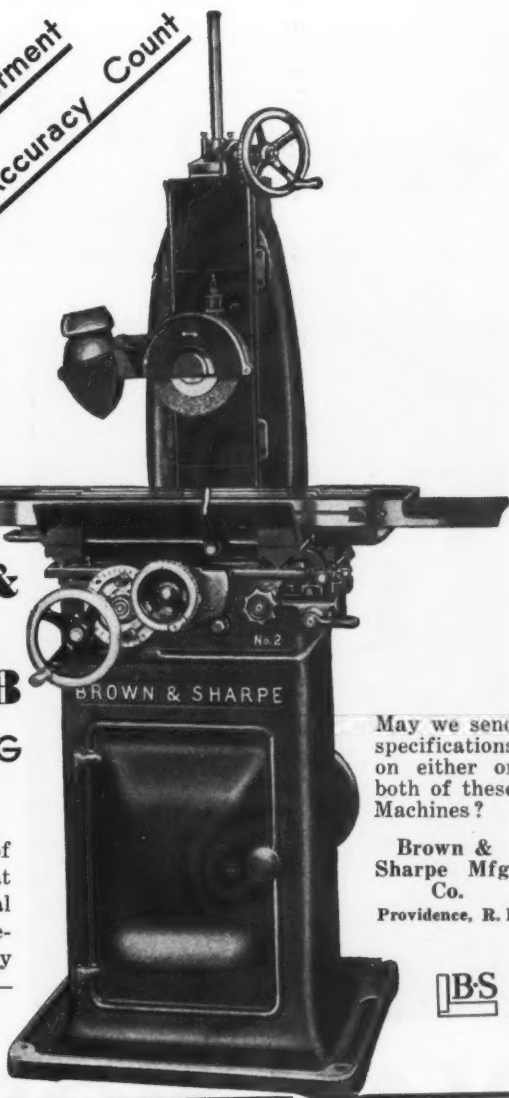
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... Always a Good Investment
Where Handiness and Accuracy Count

BROWN & SHARPE

Nos. 2 and 2B

SURFACE GRINDING MACHINES

Besides the many features of design and construction that bring about this "universal popularity" the range of usefulness is further increased by the attachments available—
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May we send specifications on either or both of these Machines?

Brown & Sharpe Mfg. Co.
 Providence, R. I.



Capacity: Grinds work to 18" long, 6" wide and 9½" high, using a wheel 7" in diameter.

No. 2—Longitudinal feed automatic, transverse feed automatic at reversal of table.

No. 2B—Hand longitudinal and transverse feeds.

ANNOUNCING
A NEW *Universal* MILLER



**The Van Norman
NO. 22**

In this new No. 22, Van Norman presents a *universal miller* . . . with power feeds throughout . . . a fast and efficient machine not only for the tool room but for many production jobs.

Like all Van Norman millers, the No. 22 has a swiveling cutter head that mills vertical, horizontal or *angular* surfaces through the whole run of the table. A shift of the cutter head takes ten seconds or less, and *saves the set-up*. No tricky, time-consuming blocking. Handy attachments adapt the machine for cutting spirals and compound angles, slotting, profiling, boring, drilling and routing.

With all this flexibility, the No. 22 combines accuracy and rigidity for the most exacting tool and die work . . . ample range . . . and speeds that cut costs on regular production milling.

Write today for complete specifications on this new, cost-cutting, *universal* milling machine.

VAN NORMAN
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Springfield, Massachusetts

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MODERNIZE with MONARCHS

MONARCH MOTION PICTURE FILM NOW AVAILABLE

Monarch has completed a motion picture film entitled "The Development of the Lathe." It pictures the successive stages of lathe development from 500 A. D. up to the present time. Also pictures the operation of Monarch Lathes, Monarch Keller Form Turning Machine, and the new Monarch ~~Machine~~ Film takes one hour to show. It will be loaned to you without obligation.

THROUGHOUT the entire depression, Monarch sold many lathes and special machines . . . only because Monarch units have been progressively modernized and because they represent the very last word in design, productiveness and economy. That is why, in many plants, today, Production Executives are carefully reading their Monarch bulletins and methodically comparing the many advanced features of design and construction that make for maximum production and minimum cost.

Before you make any decisions, get the latest bulletin on these modern Monarch machines: Engine lathes in all sizes and swings from 12" to 36" inclusive—Tool-room Precision Type Lathes from 12" to 18", inclusive—Monarch Keller Automatic Form Turning Machines—Monarch ~~Machine~~ All Electric Full Automatic Double Carriage Lathe and special lathes for doing the unusual and difficult jobs.

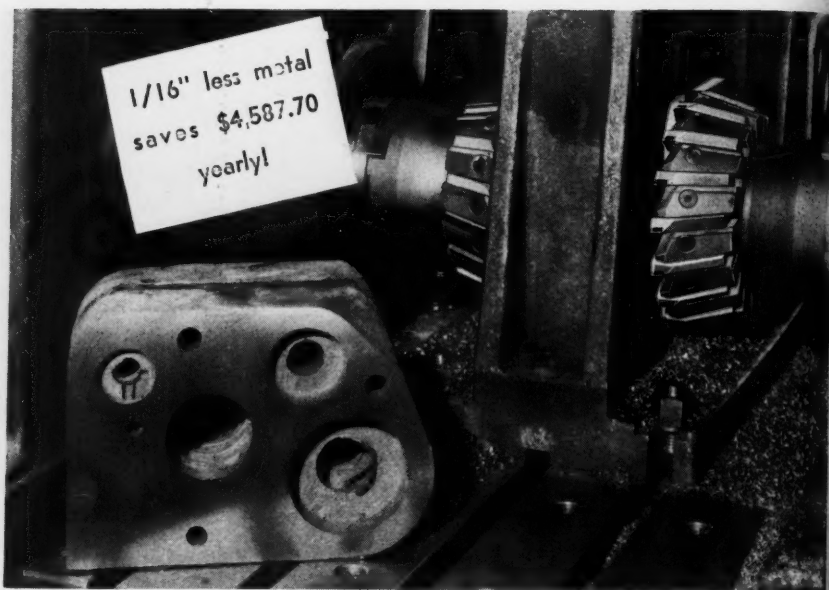
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MONARCH MACHINE TOOL CO., SIDNEY, OHIO, U. S. A.

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With Carboloy you can take **LIGHT** cuts under scale—skim cuts if necessary—and still get long cutter life. Ordinary cutters can't do this; you must provide a large amount of waste metal to allow the cutters to get well under the tough scale. Hence, with Carboloy, you can reduce your casting size and save money.

In the application shown above, the

casting was reduced $1/16''$ on all faces to be milled. Net yearly saving of \$4587.70 in metal was made. This saving was possible **ONLY** by the use of Carboloy cutters.

Investigate Carboloy cutters for worthwhile savings on **YOUR** jobs. You'll get higher speeds, faster feeds, greater accuracy, long cutter life **PLUS** a substantial saving of surplus metal usually wasted!

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*is lubrication playing its
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METAL FORMING *operations?*

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The modern magic of metal forming has made things possible that were once undreamed of—particularly in the way of high speeds and lowered unit costs. Indispensable to automobile manufacture, and now widely accepted for the production of small containers, cooking utensils, etc., metal forming is *dependent on correct lubrication* in direct proportion to the draw.

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☐ "Lubrication in Honing and Lapping Operations"

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(attach list of any additional subjects in which you are specifically interested . . .)

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Certain defects were observed in this volume when it was received by University Microfilms, Inc. Since we were unable to locate a perfect copy, this volume was filmed as received.

University Microfilms, Inc., Ann Arbor, Mich.